

**From:** Whittaker, Laura [laura.whittaker@aptim.com]

**Sent:** Friday, August 31, 2018 6:03 AM

**To:** Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]

**CC:** Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Fowler, Janet CIV NAVSEA, SEA 04N [janet.fowler1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Guillory, Jeffrey [jeffrey.guillory@aptim.com]; Amy Mangel [amy.mangel@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]

**Subject:** [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY A2 (Use 10)

**Attachments:** HPNS APTIM RSY A2 (Use 10) Soil Non-LLRW Concurrence Request 08312018 (reduced).pdf

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.



Laura Whittaker  
Senior Radiation Control Technician 4, Radiation Safety  
Cell: +423 544 9145  
[Laura.Whittaker@aptim.com](mailto:Laura.Whittaker@aptim.com)

APTIM  
Hunters Point Naval Shipyard  
200 Fisher Avenue  
San Francisco, CA 94124



## Hunters Point Naval Shipyard, Parcel E-2 RSY Data Report

Contract No. EMAC III CTO-0013		
RSY Pad: A2	RSY Pad Use Number: USE 10	First Submittal <input checked="" type="checkbox"/> Second Submittal <input type="checkbox"/>
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 08/31/2018

Soil Sample Data					
Sample Identification	Survey Location	Type of Sample	<sup>226</sup> Ra Final Analytical Results (pCi/g)	<sup>137</sup> Cs Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
Upper limit of site reference background			1.633	0.113	0.331
PE2-RSYA2-U10-S001	1	Systematic	0.540	0.0383	0.0183
PE2-RSYA2-U10-S002	2	Systematic	0.568	-0.0621	N/A
PE2-RSYA2-U10-S003	3	Systematic	0.526	-0.0537	N/A
PE2-RSYA2-U10-S004	4	Systematic	0.657	-0.0641	N/A
PE2-RSYA2-U10-S005	5	Systematic	0.592	-0.0406	N/A
PE2-RSYA2-U10-S006	6	Systematic	0.783	0.00582	N/A
PE2-RSYA2-U10-S007	7	Systematic	0.497	-0.00803	N/A
PE2-RSYA2-U10-S008	8	Systematic	0.746	-0.0151	N/A
PE2-RSYA2-U10-S009	9	Systematic	0.666	-0.0262	N/A
PE2-RSYA2-U10-S010	10	Systematic	0.544	-0.0353	N/A
PE2-RSYA2-U10-S011	11	Systematic	0.598	0.0136	0.0597
PE2-RSYA2-U10-S012	12	Systematic	0.413	0.1020	N/A
PE2-RSYA2-U10-S013	13	Systematic	0.189	0.0321	N/A
PE2-RSYA2-U10-S014	14	Systematic	0.684	0.0268	N/A
PE2-RSYA2-U10-S015	15	Systematic	0.855	0.00298	N/A
PE2-RSYA2-U10-S016	16	Systematic	0.825	-0.0120	N/A
PE2-RSYA2-U10-S017	17	Systematic	0.623	0.00151	N/A
PE2-RSYA2-U10-S018	18	Systematic	0.743	-0.0184	N/A

<sup>226</sup>Ra Radium-226

<sup>137</sup>Cs Cesium-137

Sr Strontium

pCi/g Picocuries per gram

Sample results shown for <sup>226</sup>Ra and <sup>137</sup>Cs are from the final re-analysis

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-06292018-PE2-ROV2-2681	06/29/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,872 CPS	3,004-4,372 CPS
RSI Follow-up Static Survey	HPRS-07092018-PE2-JSS2-2729	07/09/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	3,403-4,223CPS
Systematic Sample Survey	HPRS-06292018-PE2-JSS-2689	06/29/2018	2221	07/12/2018	271439	15,783 CPM	18,714 CPM	N/A	N/A	14,102-16,452 CPM

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)

CPS Counts per second

CPM Counts per minute

### Summary

1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).

2) RSI Follow-up static survey—33 locations identified during the data review process were investigated, with readings less than the Reference Area static IL at all locations for regions of interest (ROIs) 3, 6, 7, 8, and 10 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).

3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 80-101).

Ten percent of the systematic soil samples (two samples in total, PE2-RSYA2-U10-S001 & PE2-RSYA2-U10-S011) were also analyzed for total strontium. Total Strontium results are also included in the Initial TestAmerica sample results report (pages 44-67).

Note: Cesium-137 results included in the TestAmerica sample results report (pages 44-67) exceeded the project action limits for sample PE2-RSYA2-U10-S012. A re-analysis was performed and the sample result also exceeded the project action limits (pages 68-77). A final re-analysis on all samples was requested and the results are shown on the Systematic Soil Sample Results Report (page 80-101). The final re-analysis results for all samples are within the project action limits and shown in the soil sample data table.

#### Conclusions:

**All locations with elevated Z-scores identified by the RSI gamma walkover survey were determined to be consistent with background. 33 locations were investigated during the follow-up static survey, with readings less than the Reference Area static IL at all locations for ROIs 3, 6, 7, 8, and 10 (VD1). Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 9-41).**

**Final analytical results for systematic samples from this RSY pad are concluded to be comparable to background. Histograms showing soil sample activity concentrations are provided (pages 42-43). Ten percent of the systematic soil samples (two samples in total, PE2-RSYA2-U10-S001 & PE2-RSYA2-U10-S011) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1).**

**RSY A2 (Use 10) contains soil from the chemically contaminated (Lead- greater than project action limit) over-excavation area of Freshwater Wetlands Survey Unit 05 (FW-05).**

**APTIM request RASO concurrence to release this soil as Non-LLRW.**

**Disposition: This soil shall be dispositioned as non-LLRW waste and to be disposed of off-site at a CERCLA landfill.**

## RSI Data Evaluation Process

### RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review:** The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review:** The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs:**
  - **Z-Scores:** The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three ( $Z > 3$ ) is marked for follow-up.
  - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local  $Z > 3$  is marked for follow-up.
  - **Semi-local Z-Scores:** Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local  $Z > 3$  is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
  - **Z-Scores:** The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a  $Z > 3$  is marked for follow-up.
  - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local  $Z > 3$  is marked for follow-up.
  - **Semi-local Z-Scores:** Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local  $Z > 3$  is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
  - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a  $Z > 3$  is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local  $Z > 3$  is marked for follow-up.
  - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local  $Z > 3$  is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
  - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a  $Z > 3$  is marked for follow-up.
  - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local  $Z > 3$  is marked for follow-up.
  - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local  $Z > 3$  is marked for follow-up.
- **Z-Score Time Series Review:** The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score  $> 3$  in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

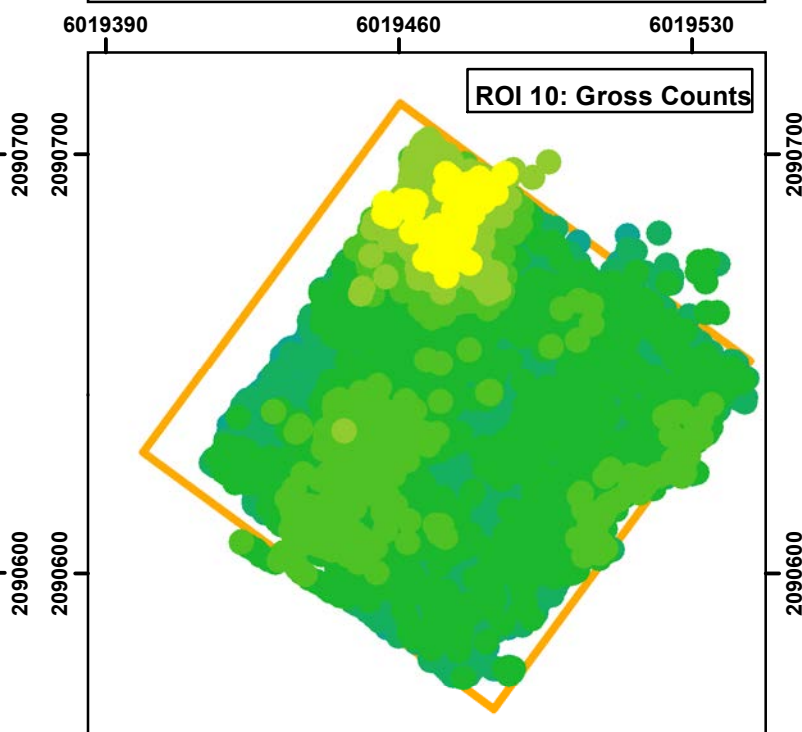
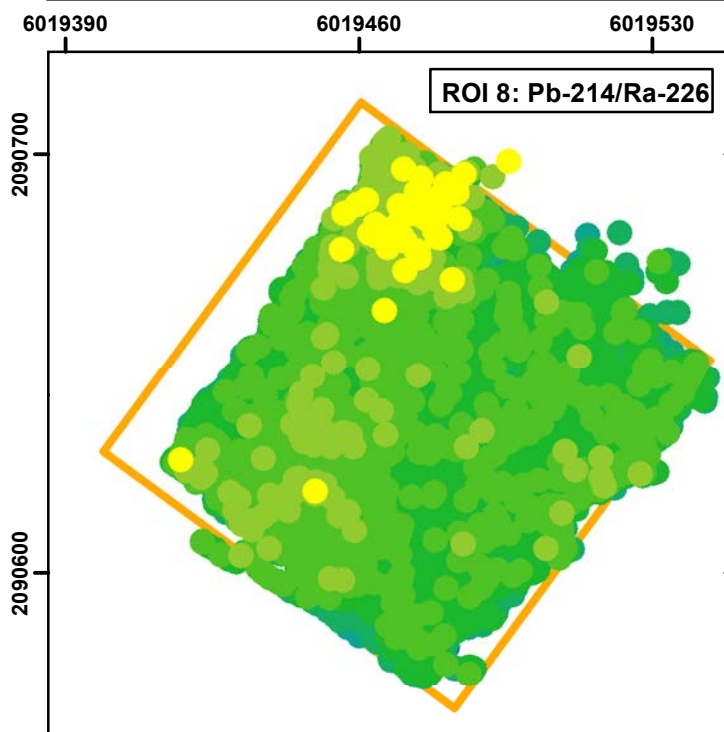
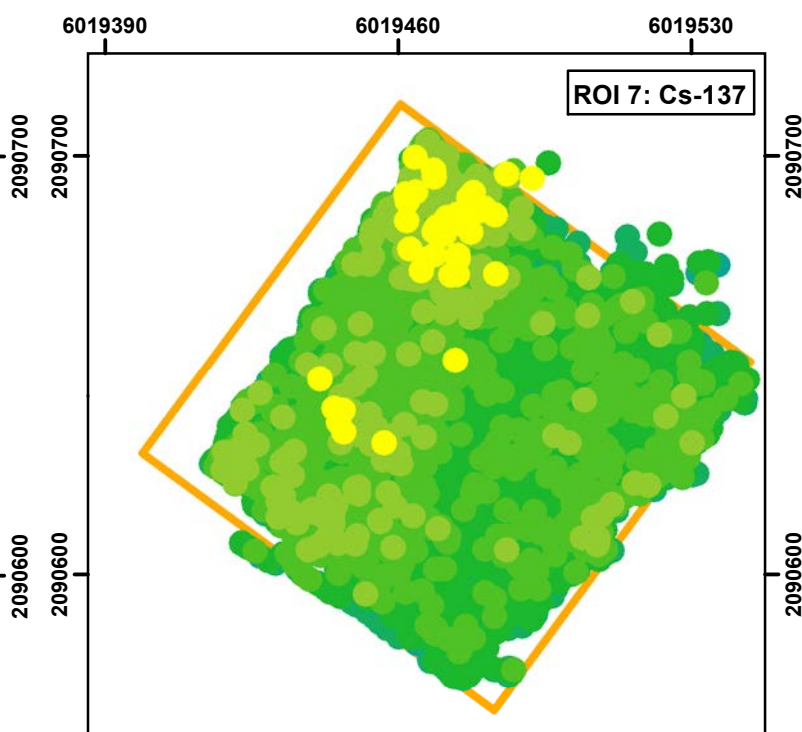
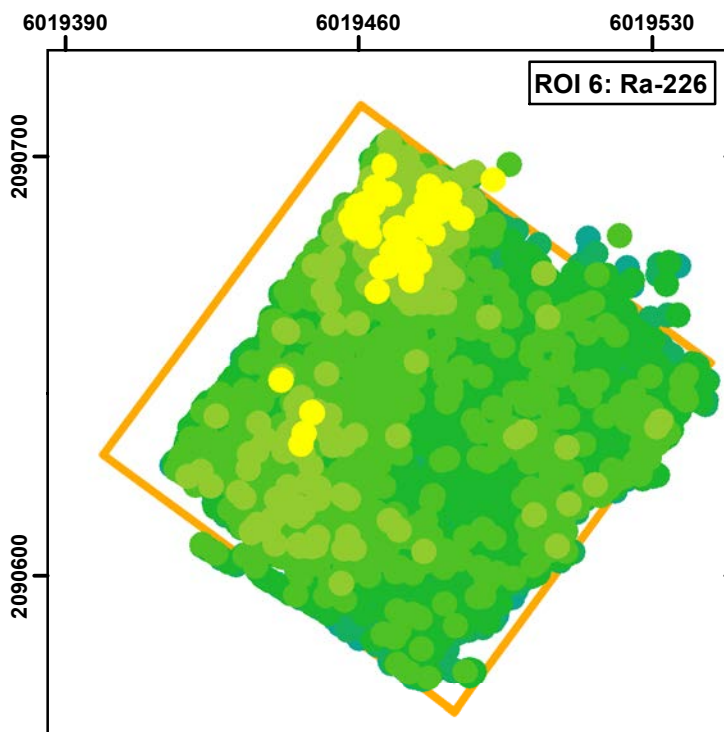
Where:

$$L_C = 2.33\sqrt{B}$$

LC	=	critical level (counts)
B	=	average background in the ROI

When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.



### RS 700 Gamma Walkover Survey Data (VD1)

- |  |  |
|--|--|
| Yellow circle: > 3 std dev             | Teal circle: > -1 to < 0 std dev       |
| Light green circle: > 2 to < 3 std dev | Dark teal circle: > -2 to < -1 std dev |
| Green circle: > 1 to < 2 std dev       | Blue circle: > -3 to < -2 std dev      |
| Dark green circle: > 0 to < 1 std dev  | Dark blue circle: < -3 std dev         |

 RSY Pad Boundaries

0 20 40 80 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot



## RSI Review Summary

### Summary:

33 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on gamma static data at these locations do not indicate the presence of  $^{226}\text{Ra}$  or  $^{137}\text{Cs}$  above background. Gamma static readings at these locations are less than the Reference Area static IL for ROIs 3, 6, 7, 8, and 10; figures are provided on pages 9-41.

RSI Follow-up Survey  
HPRS-07092018-PE2-JSS2-2729

# HPNS Parcel E-2 RSY Pad A2 (Use 10)

Soil Excavation Site:  
FW-05 Lead Overexcavation

6019390

6019460

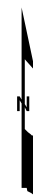
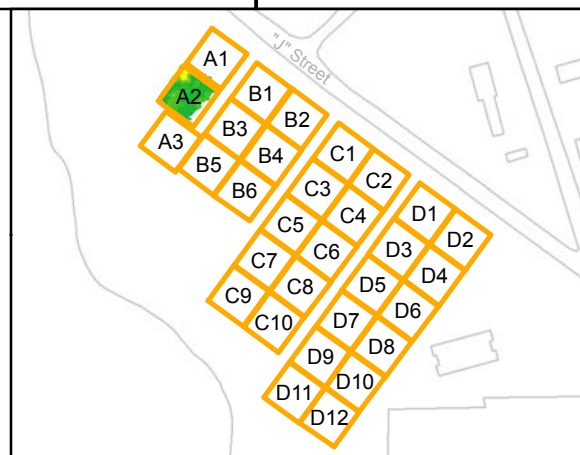
6019530

2090700

2090700

2090600

2090600



## RS 700 Gamma Walkover Survey Data (VD1, ROI 10)

- |                       |                        |
|-----------------------|------------------------|
| ◆ Follow-up Locations | ● > -1 to < 0 std dev  |
| ● > 3 std dev         | ● > -2 to < -1 std dev |
| ● > 2 to < 3 std dev  | ● > -3 to < -2 std dev |
| ● > 1 to < 2 std dev  | ● < -3 std dev         |
| ● > 0 to < 1 std dev  | □ RSY Pad Boundaries   |

0 10 20 40 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

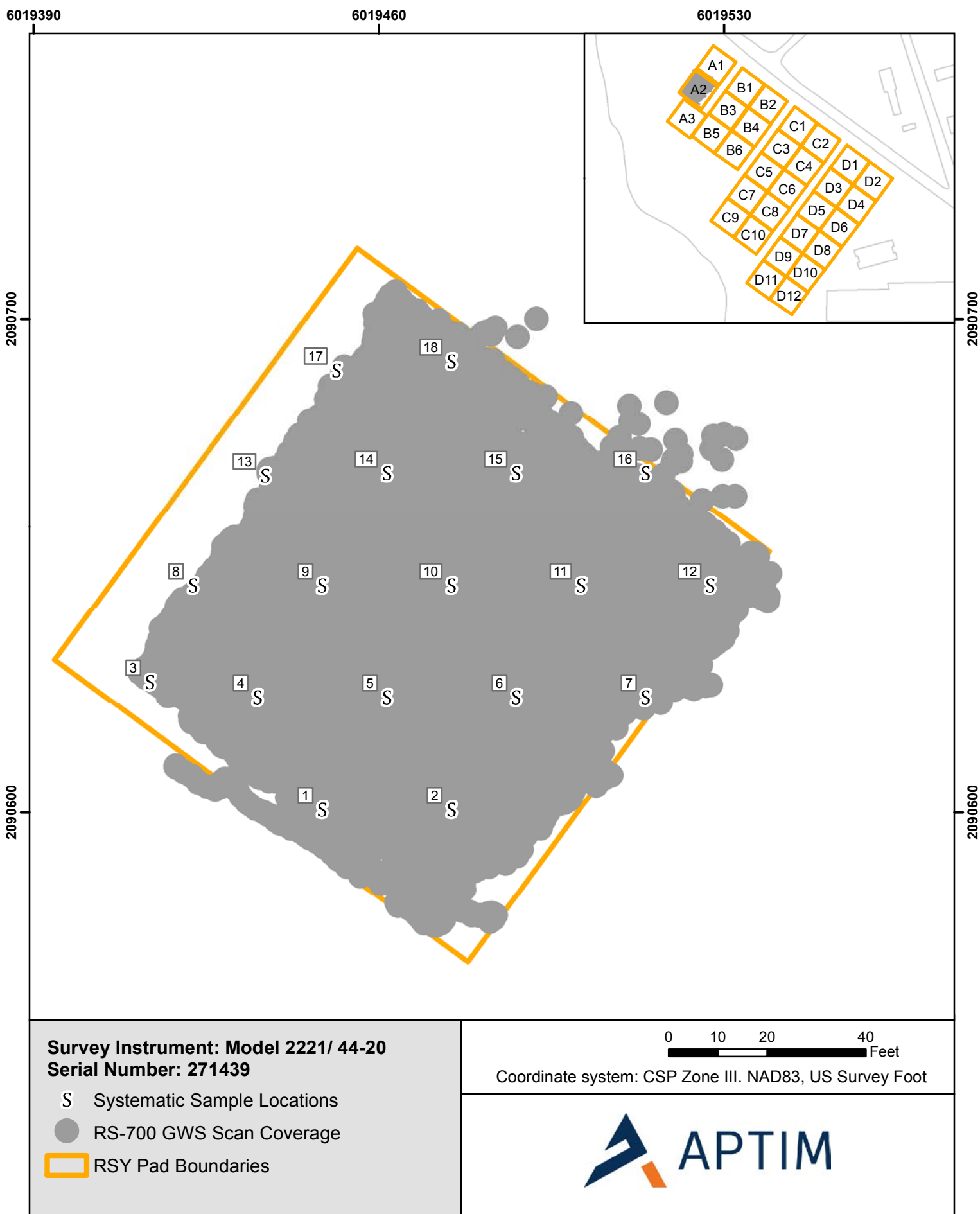


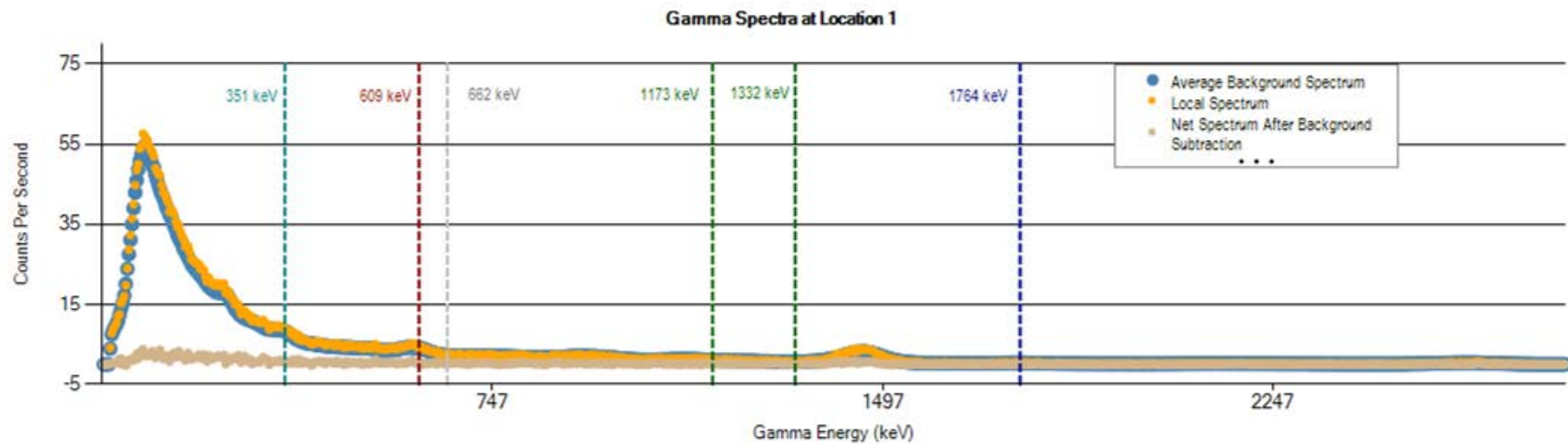
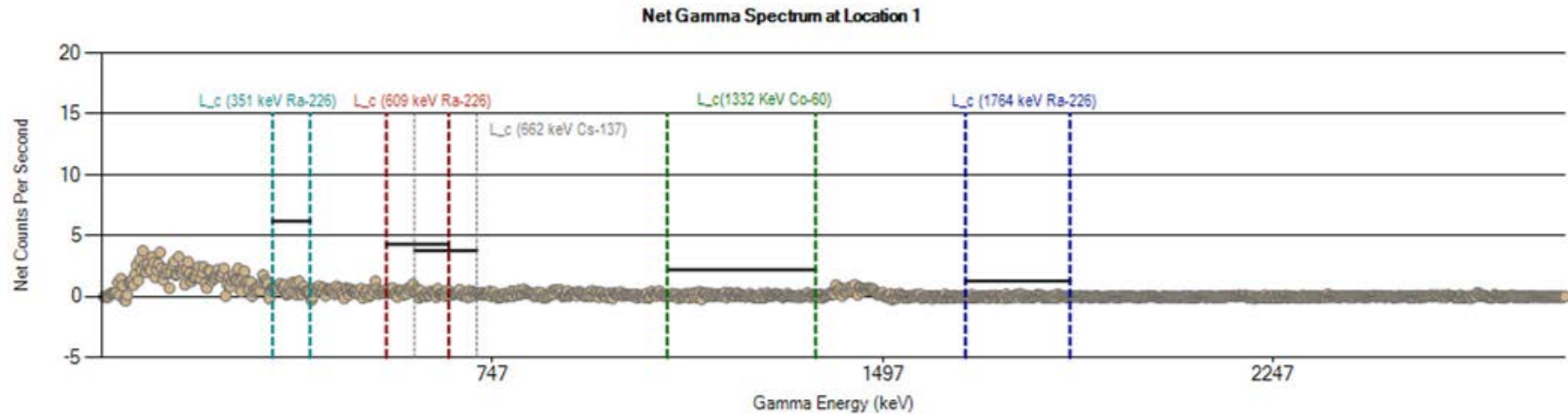


Systematic Sample Survey  
HPRS-06292018-PE2-JSS-2689

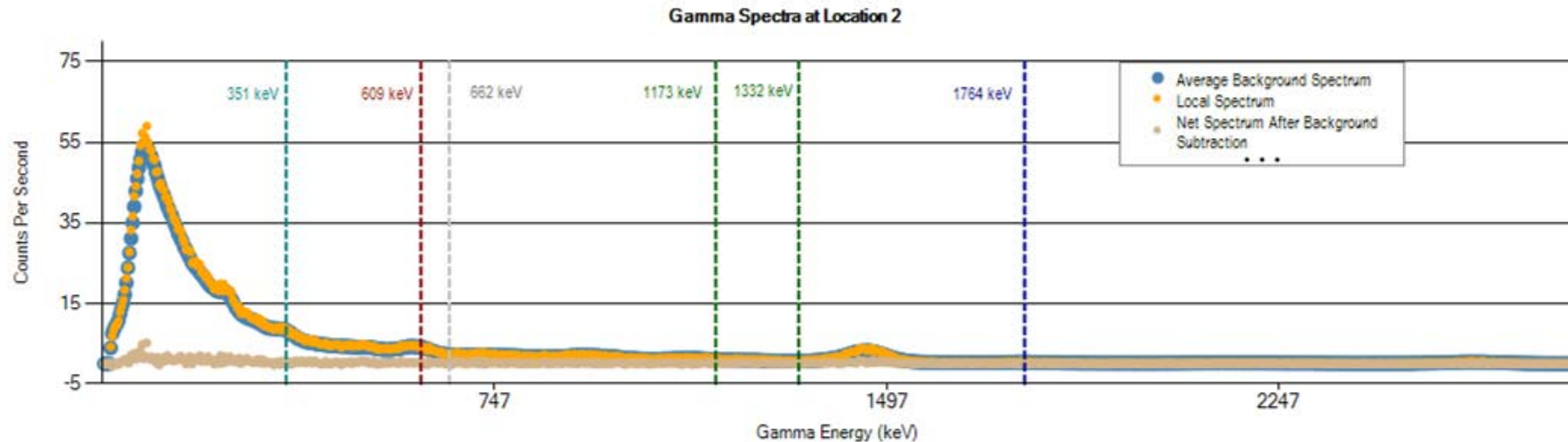
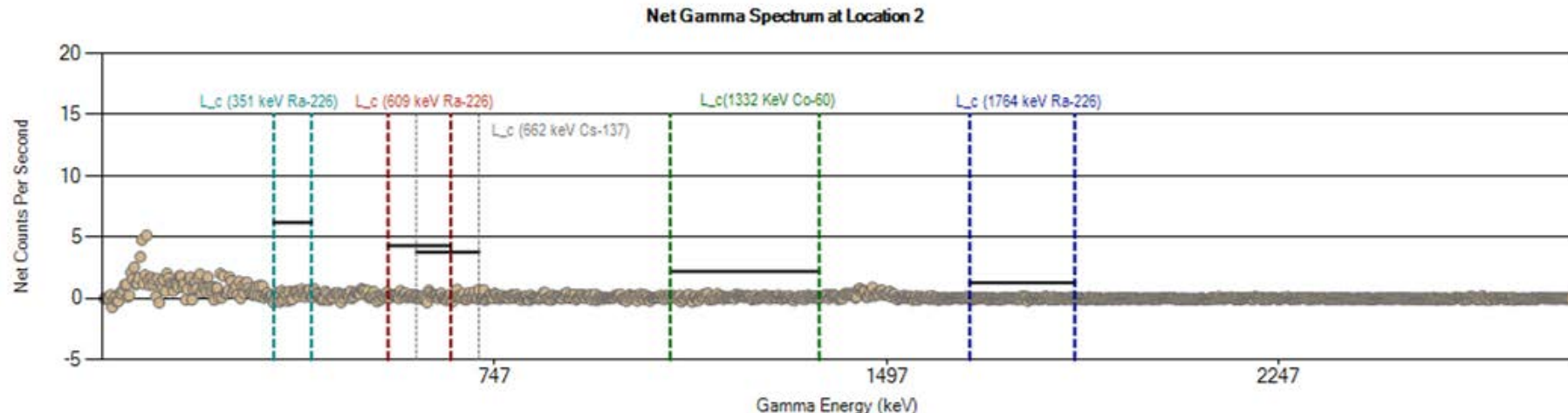
# HPNS Parcel E-2 RSY Pad A2 (Use 10)

Soil Excavation Site:  
FW-05 Lead Overexcavation

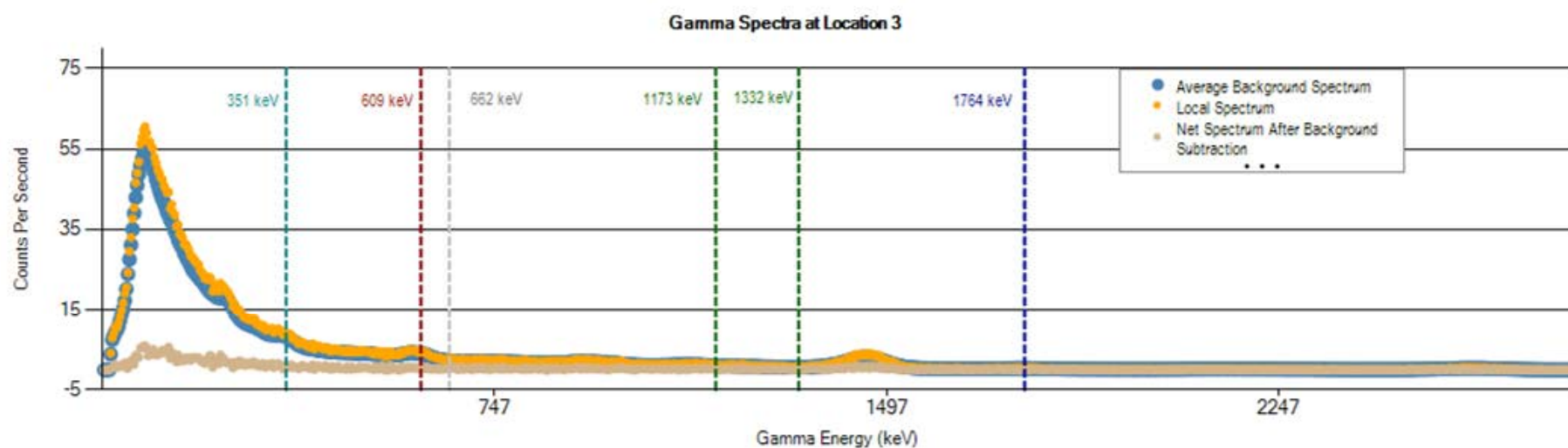
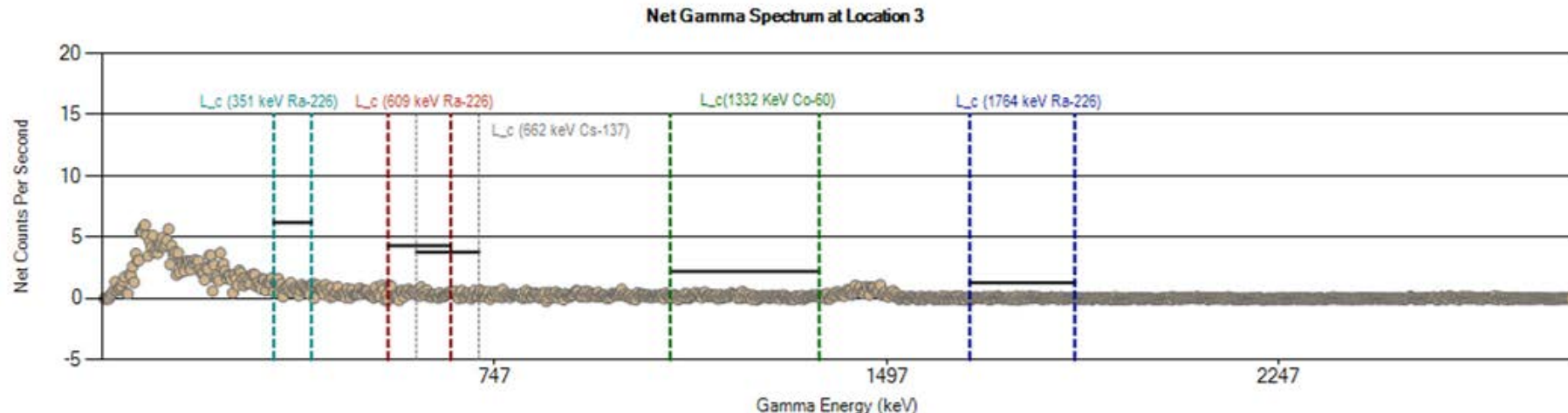




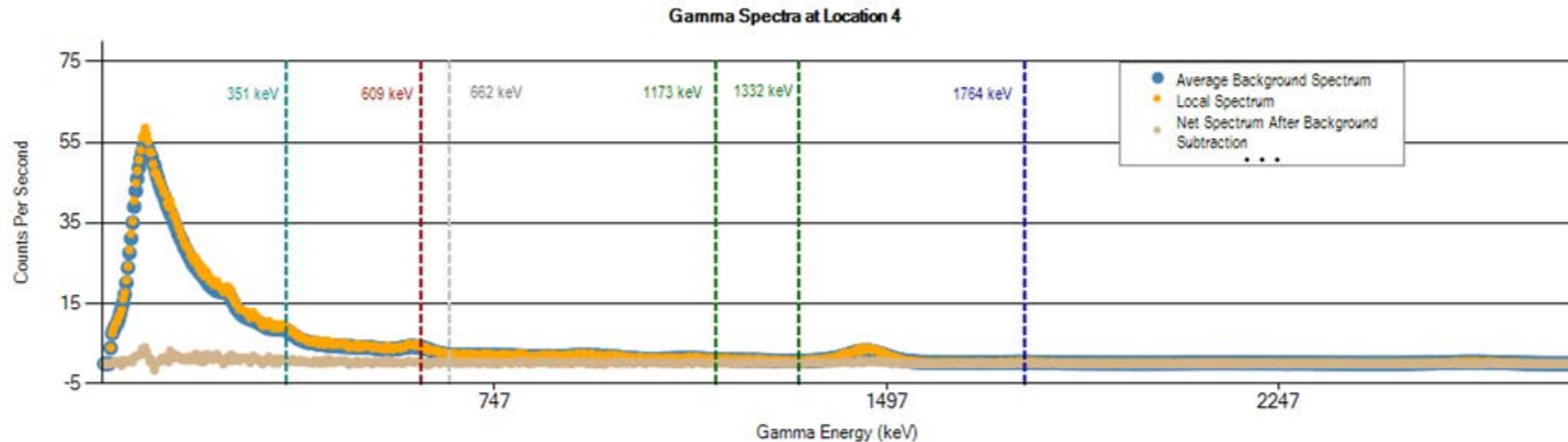
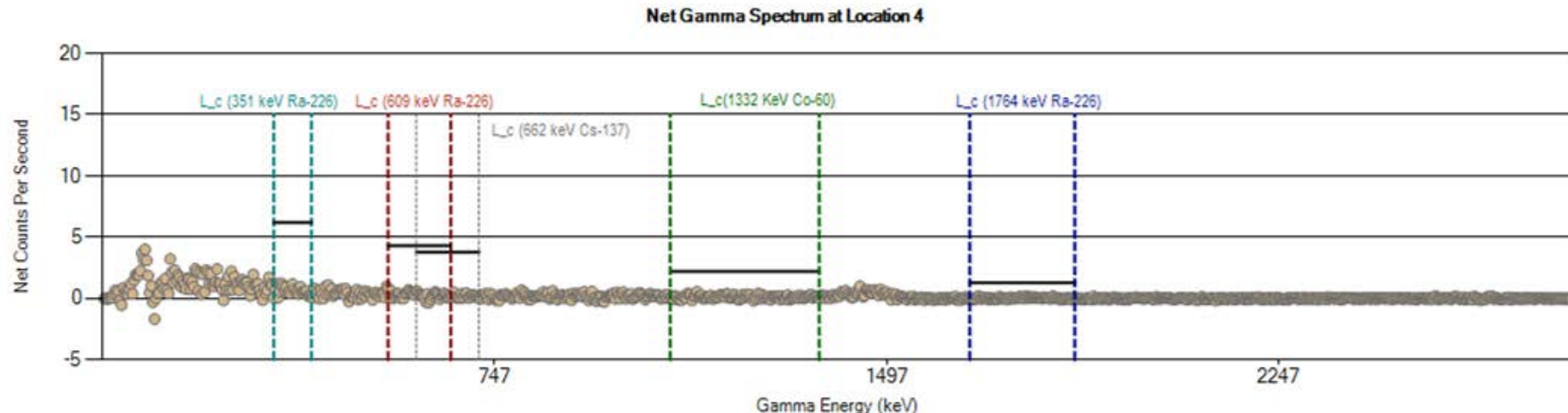
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 1 (cps)	949	133	22	26	167	154	118	189	99	3882
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 2 (cps)	918	131	21	24	162	148	114	182	98	3785
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

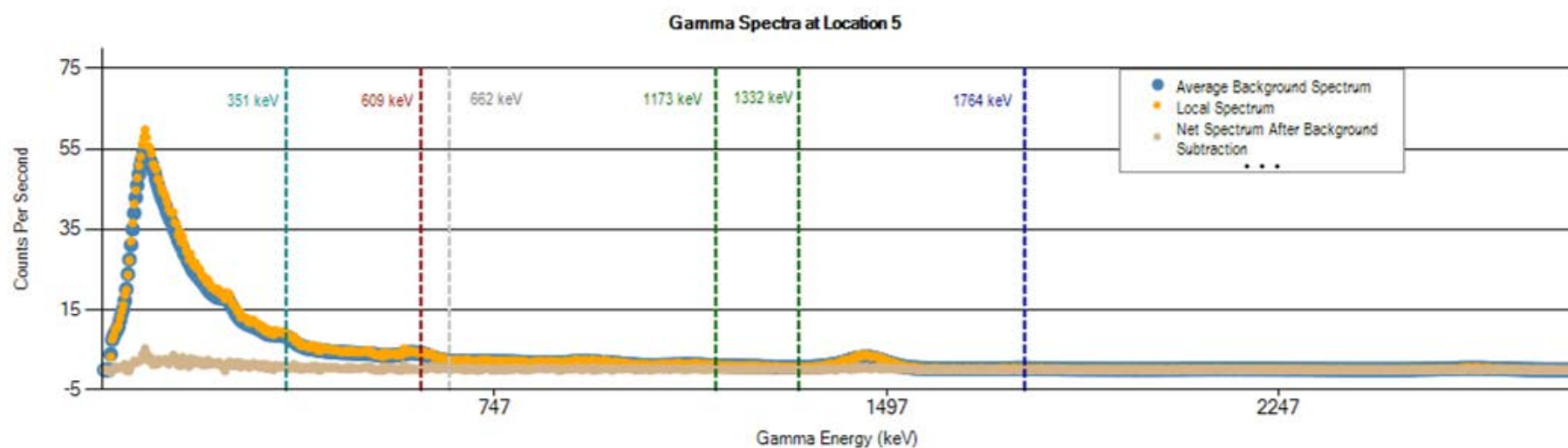
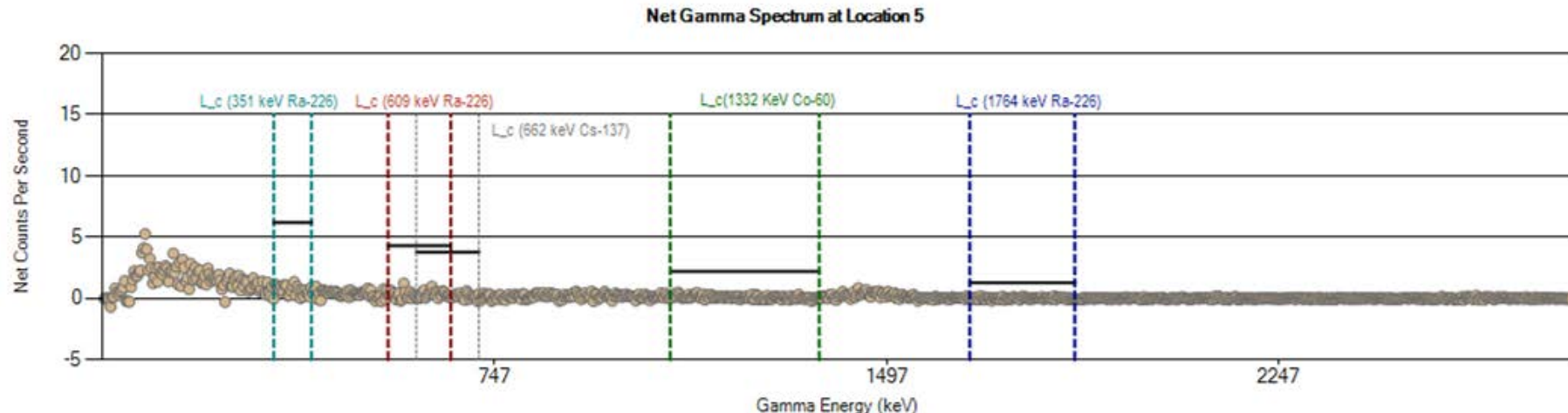


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 3 (cps)	978	139	23	26	168	157	122	196	105	4014
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

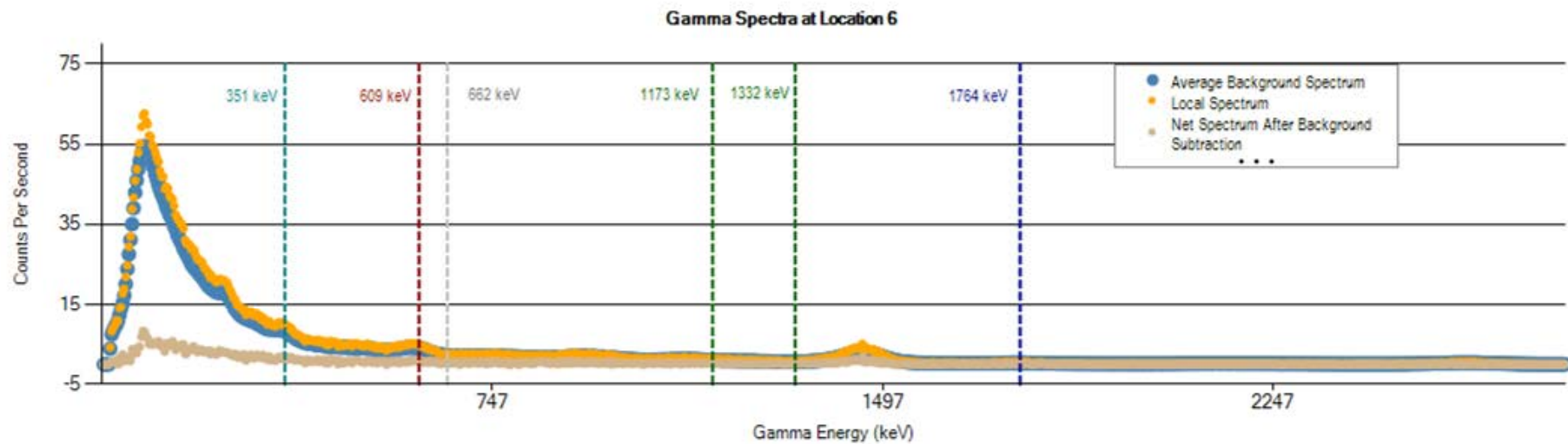
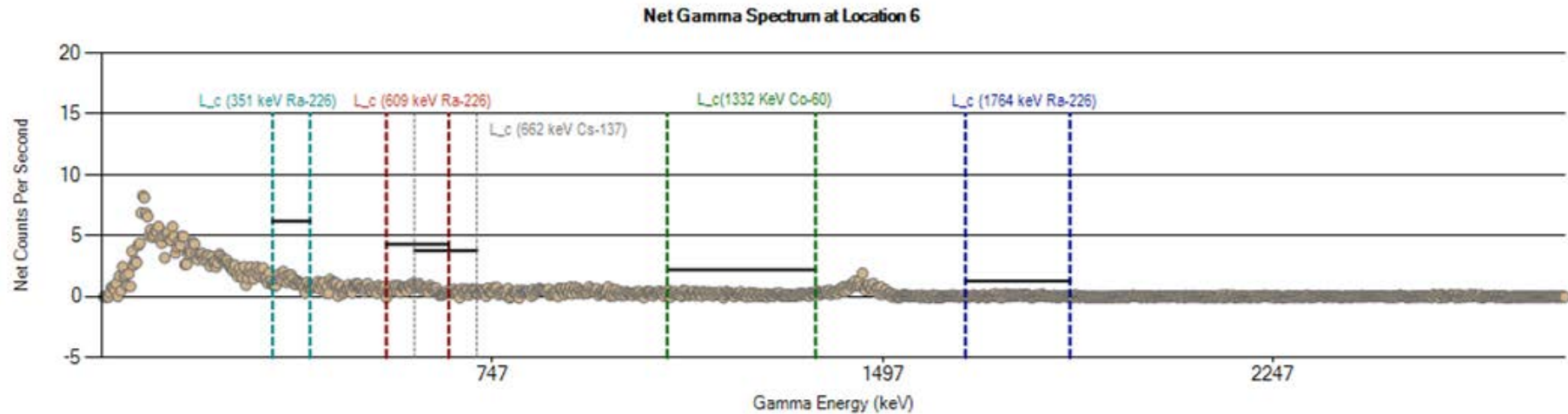


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 4 (cps)	946	133	23	26	165	152	116	190	101	3841
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

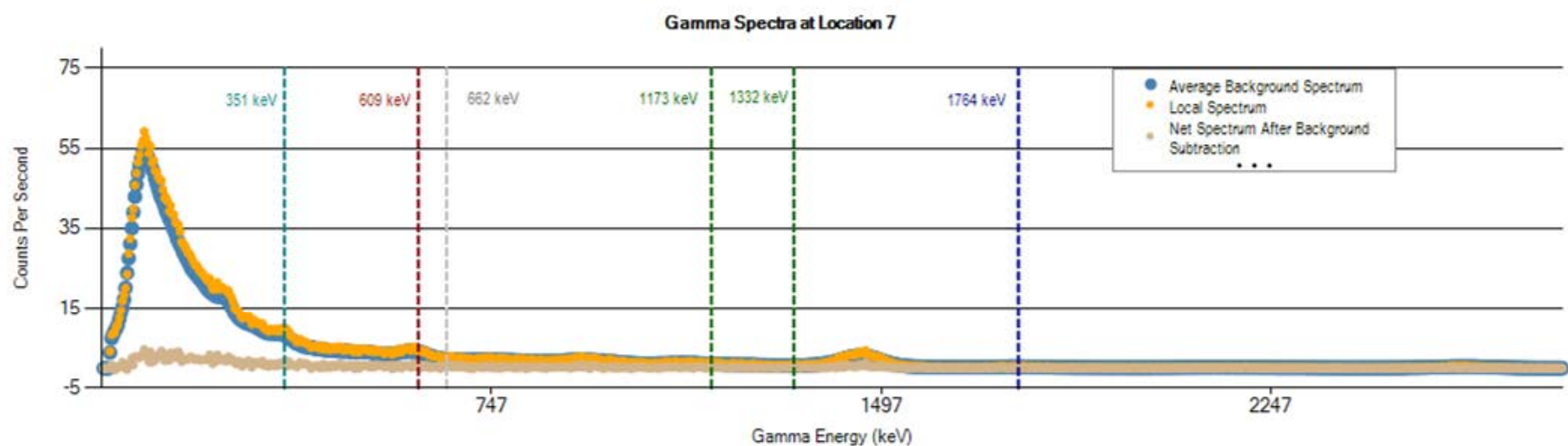
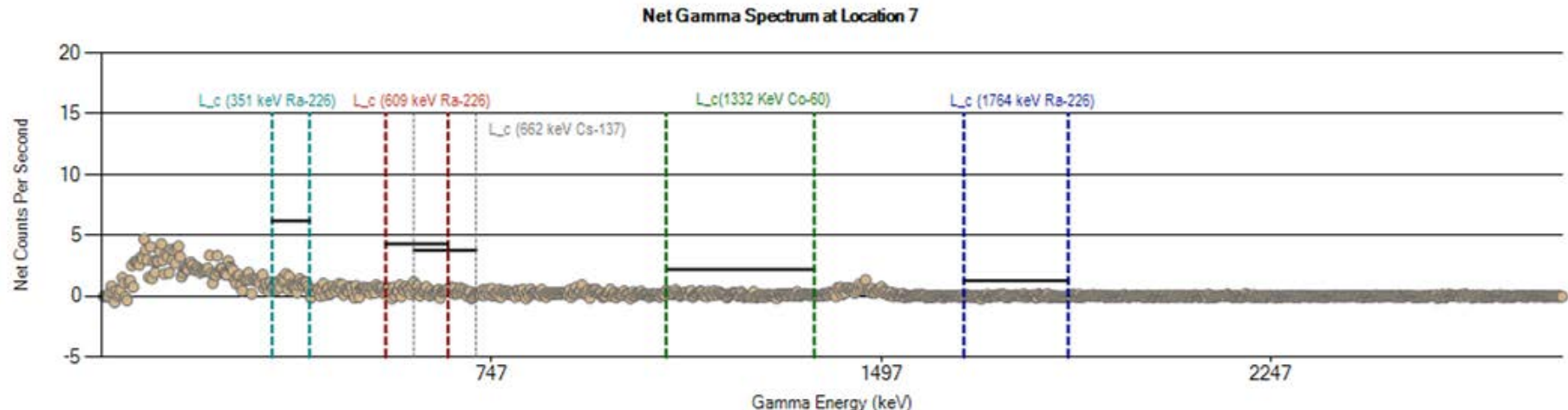




	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 5 (cps)	945	132	22	26	164	154	118	191	99	3883
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

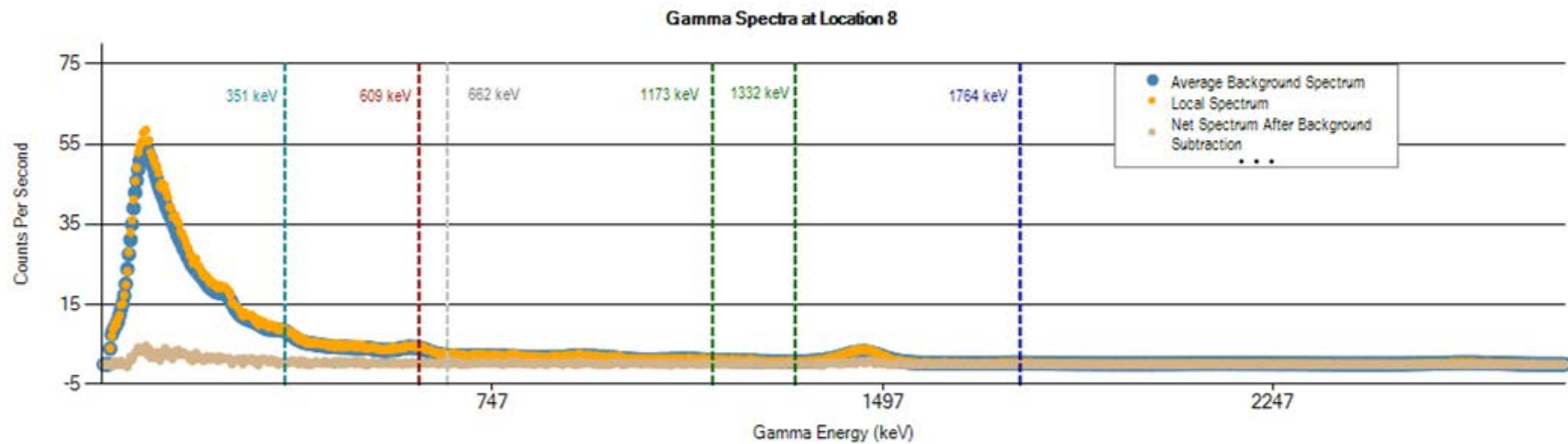
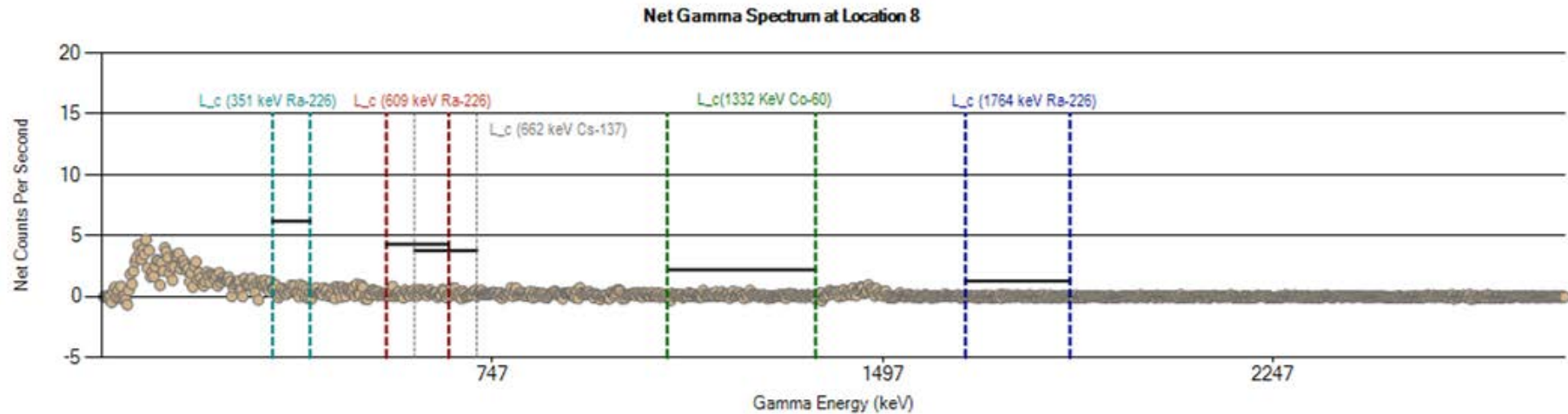


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 6 (cps)	1027	146	25	27	177	166	127	205	109	4144
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

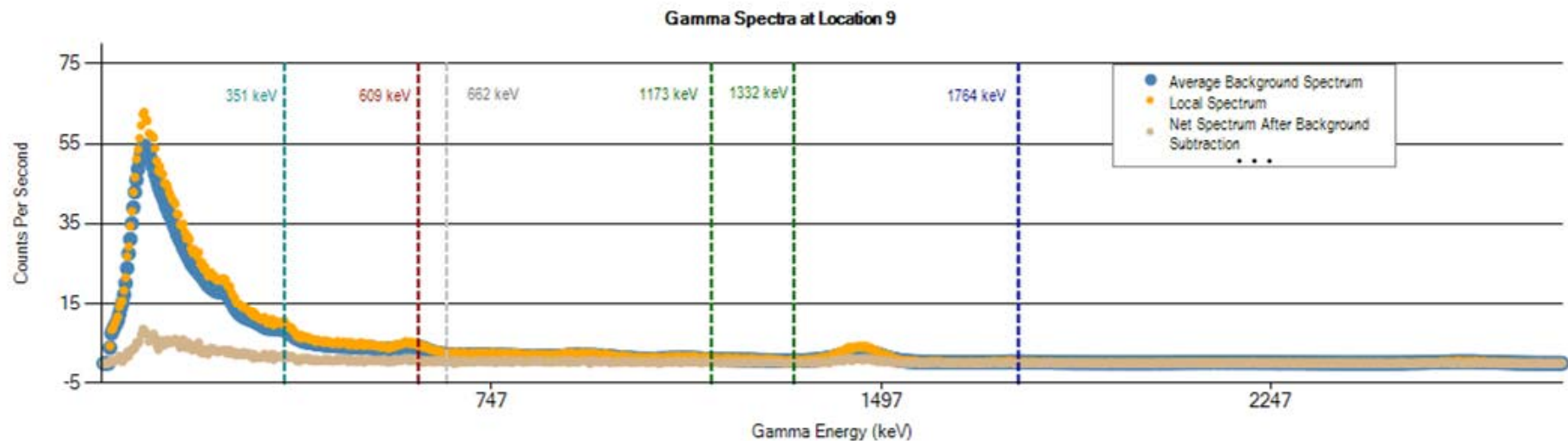
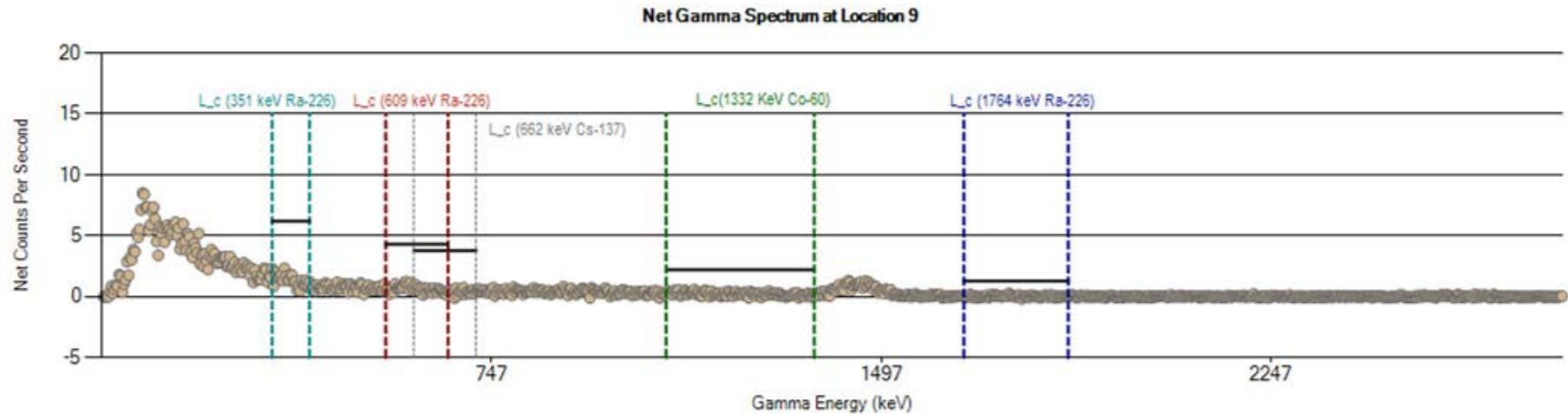


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 7 (cps)	974	136	22	26	172	159	122	199	103	3963
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

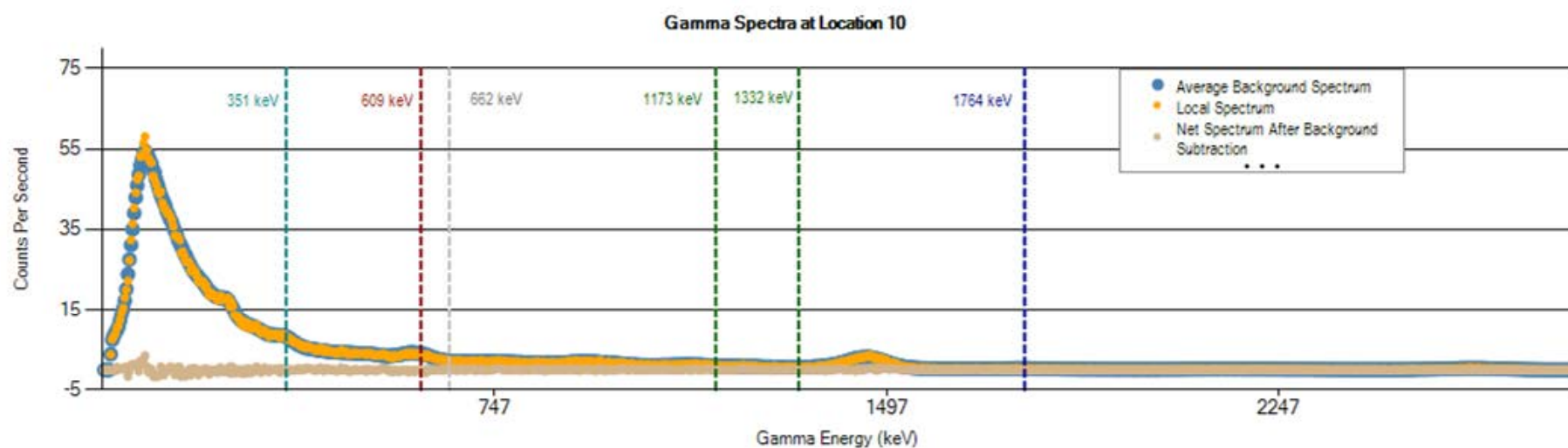
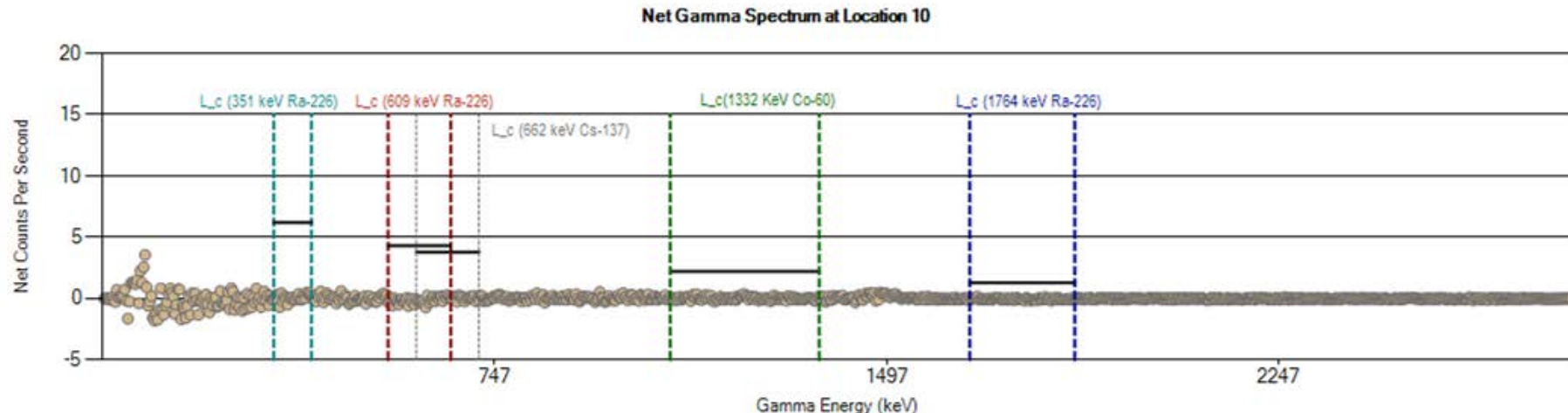




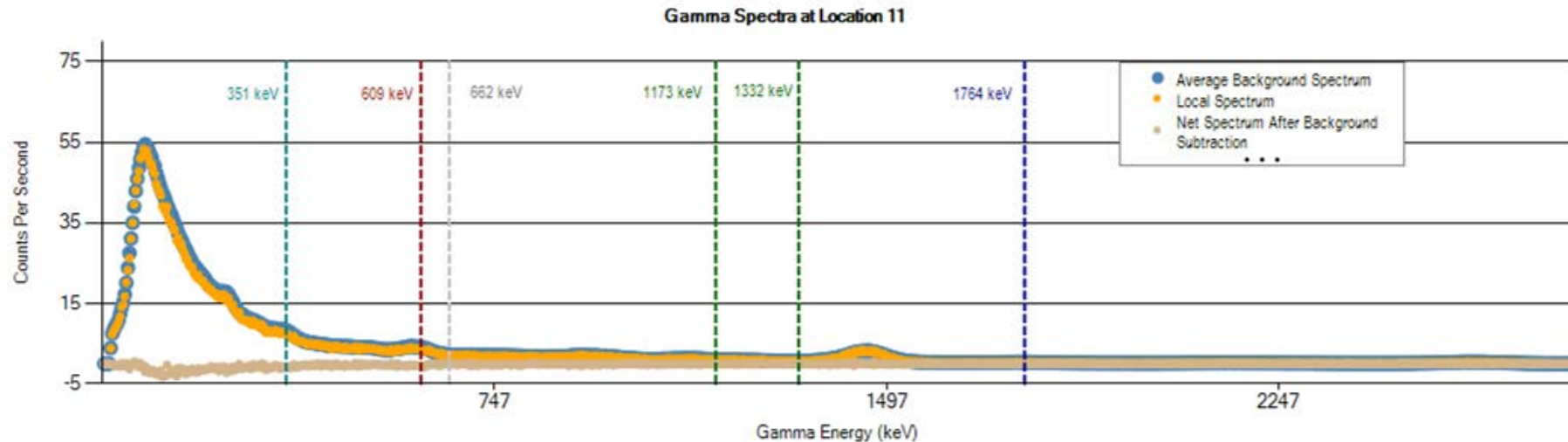
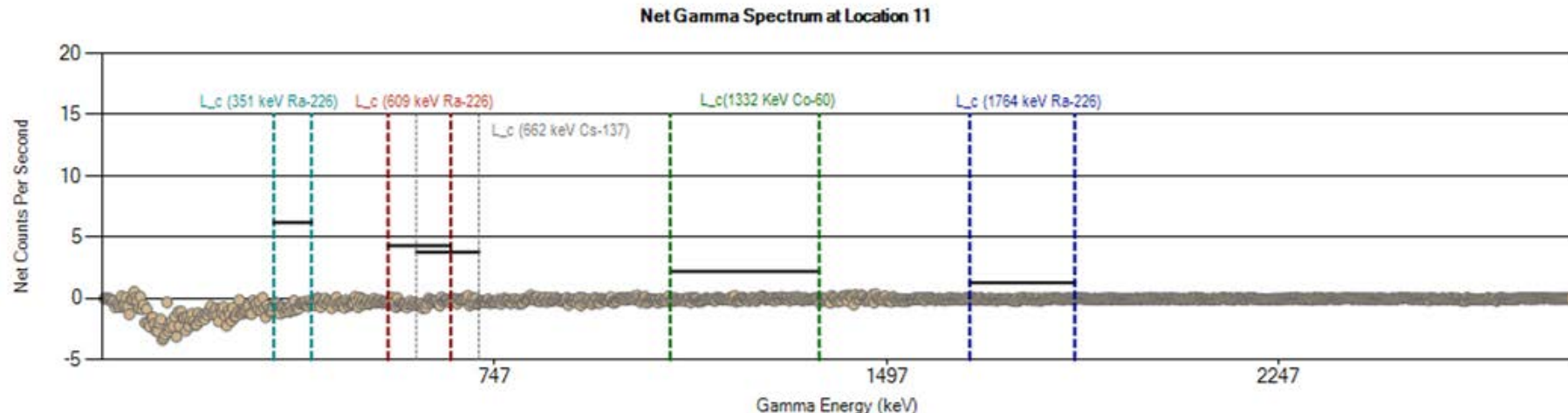
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 8 (cps)	940	131	22	24	164	151	118	185	98	3880
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



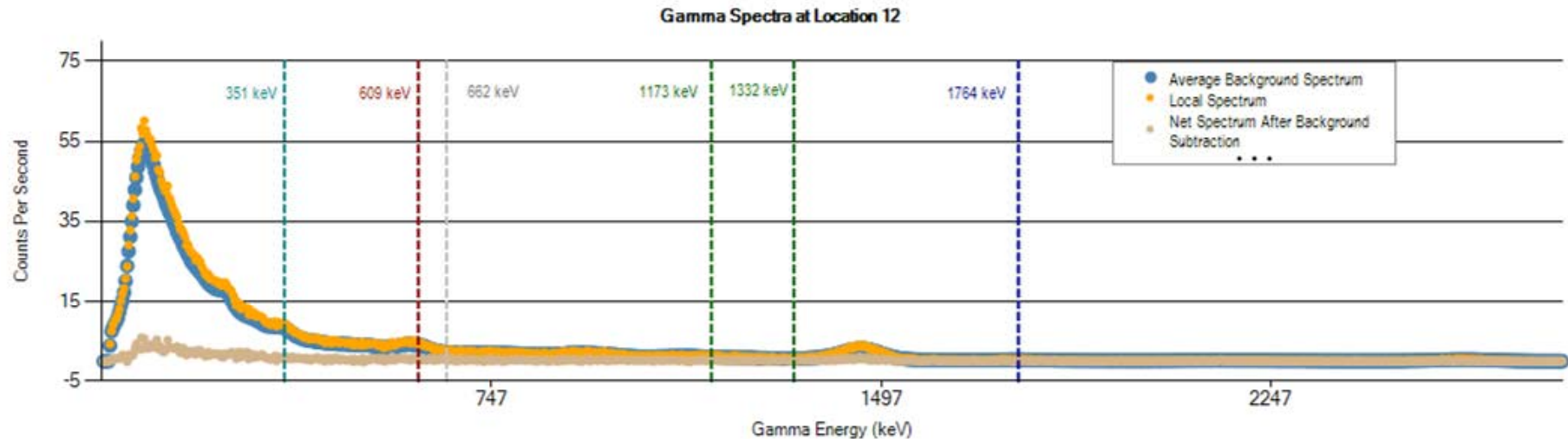
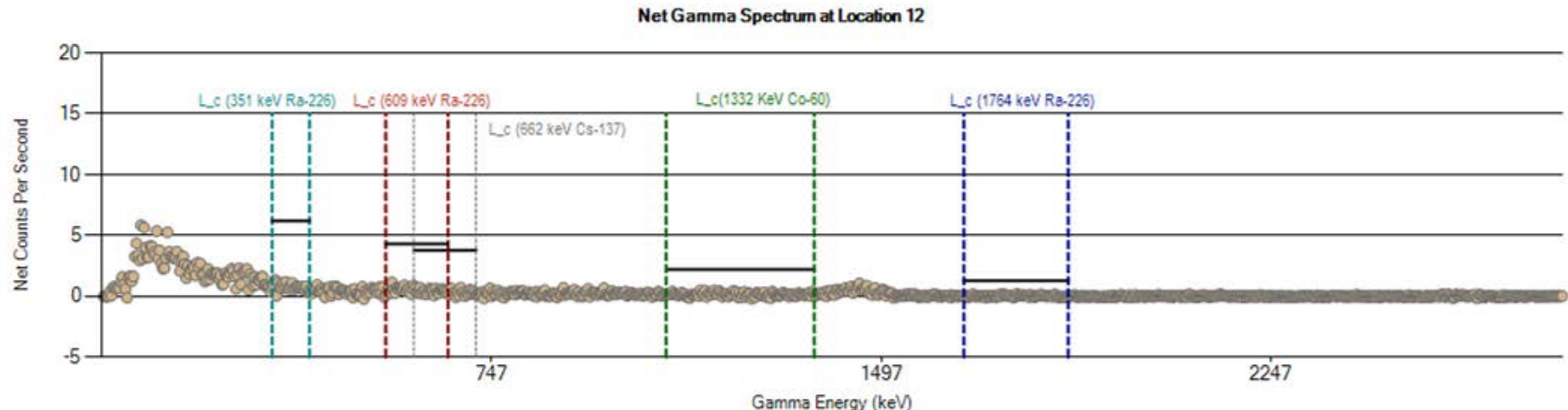
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 9 (cps)	1036	150	23	27	179	165	126	208	111	4195
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 10 (cps)	860	122	18	22	149	135	107	176	91	3611
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

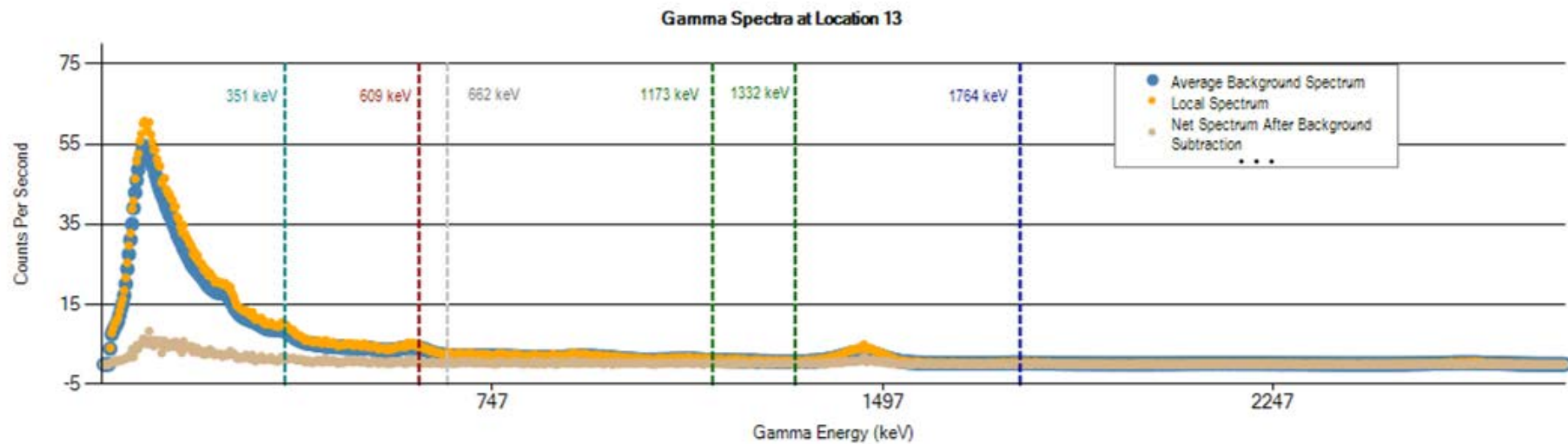
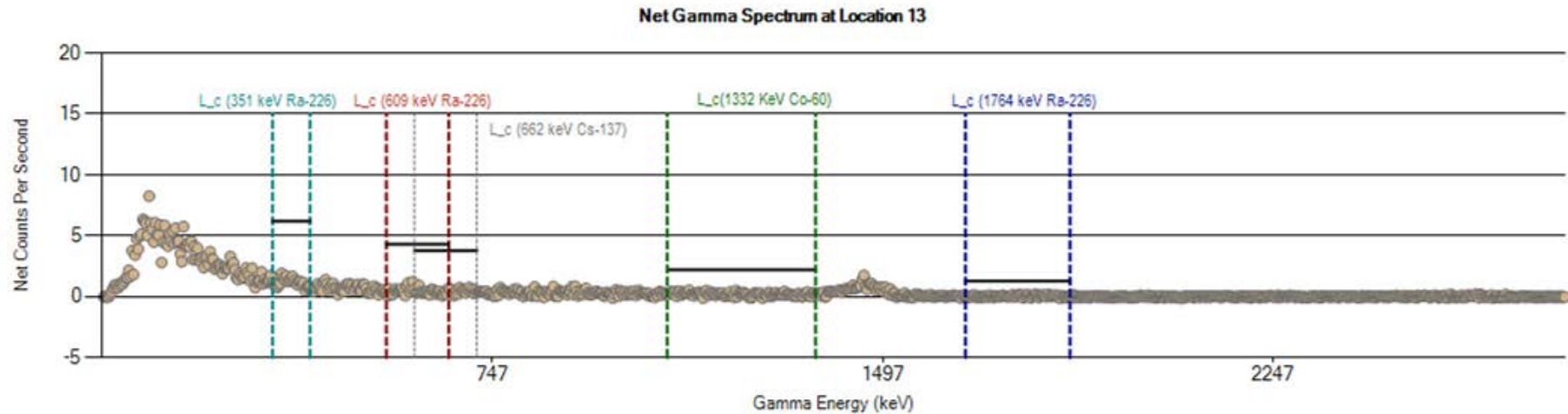


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 11 (cps)	790	113	17	21	139	126	98	159	84	3403
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

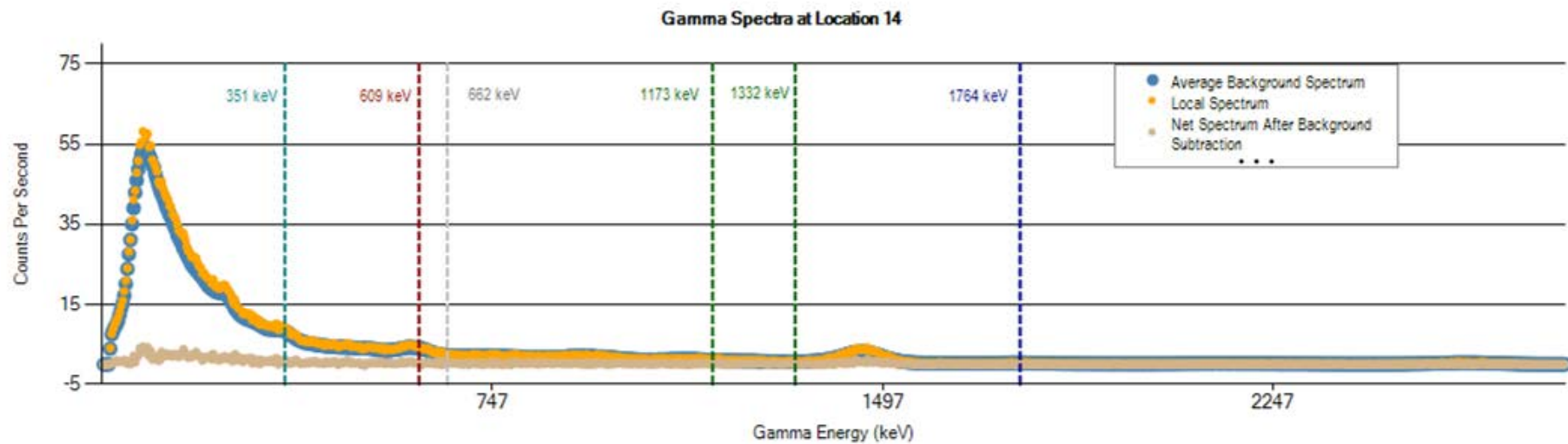
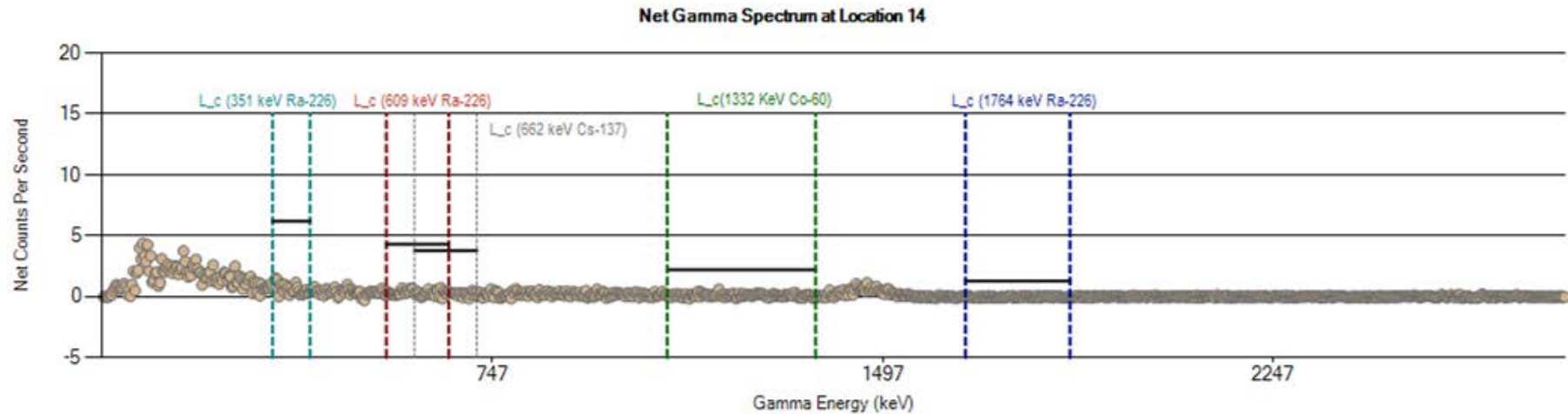


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 12 (cps)	970	137	23	25	168	161	122	193	104	3967
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

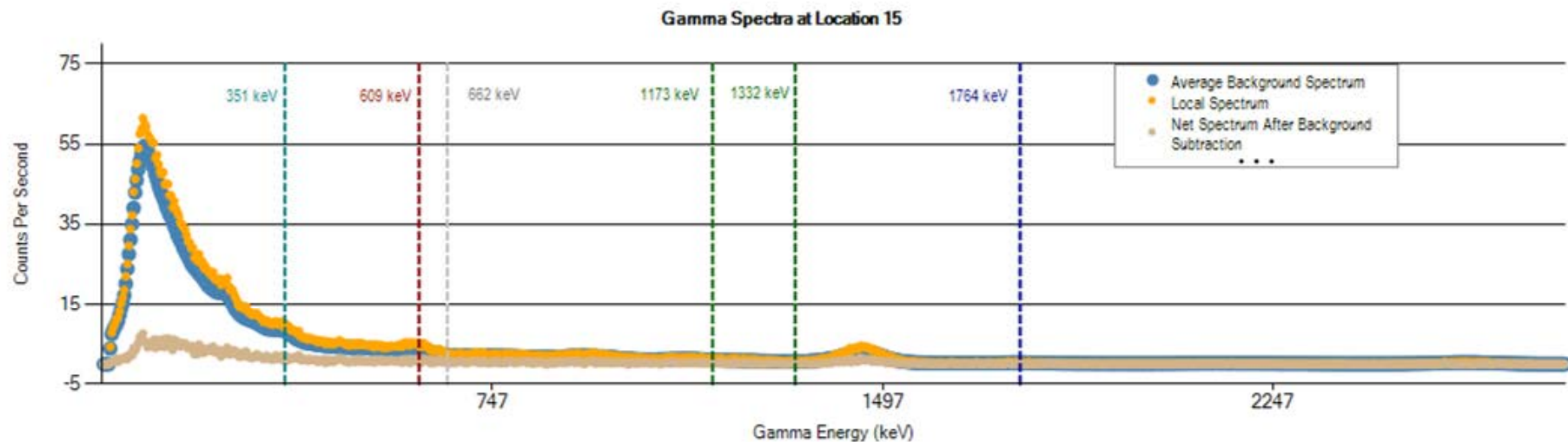
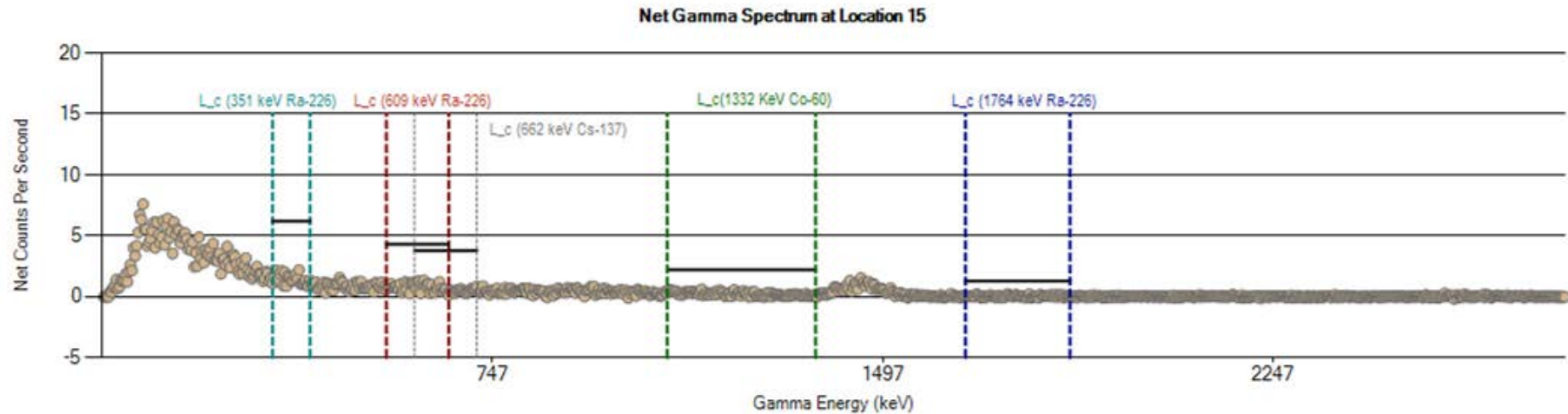




	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	1010	146	24	26	175	159	124	203	109	4114
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

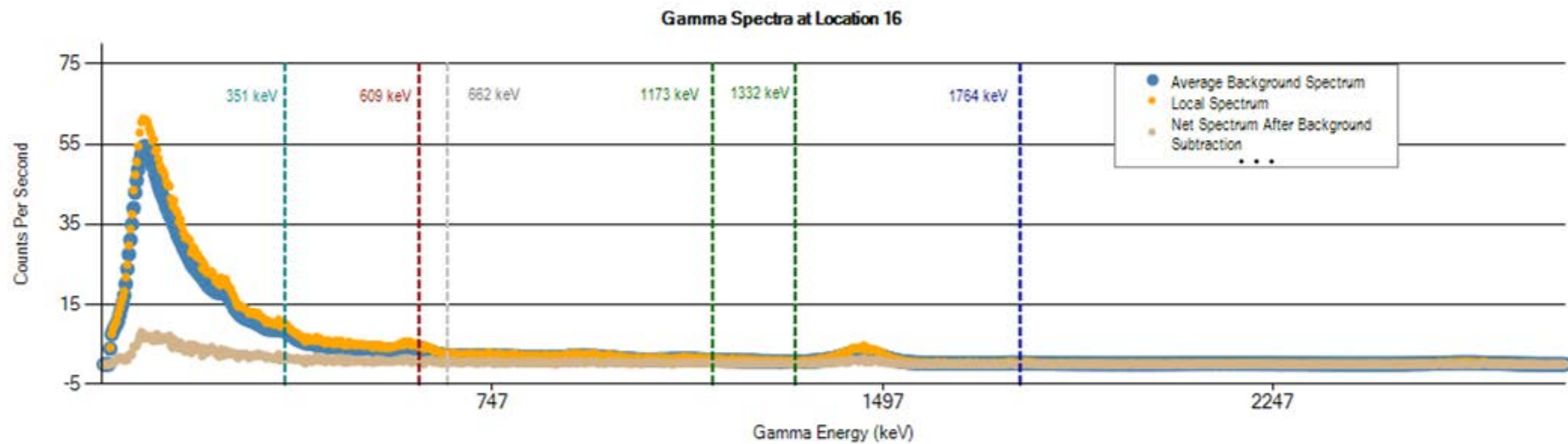
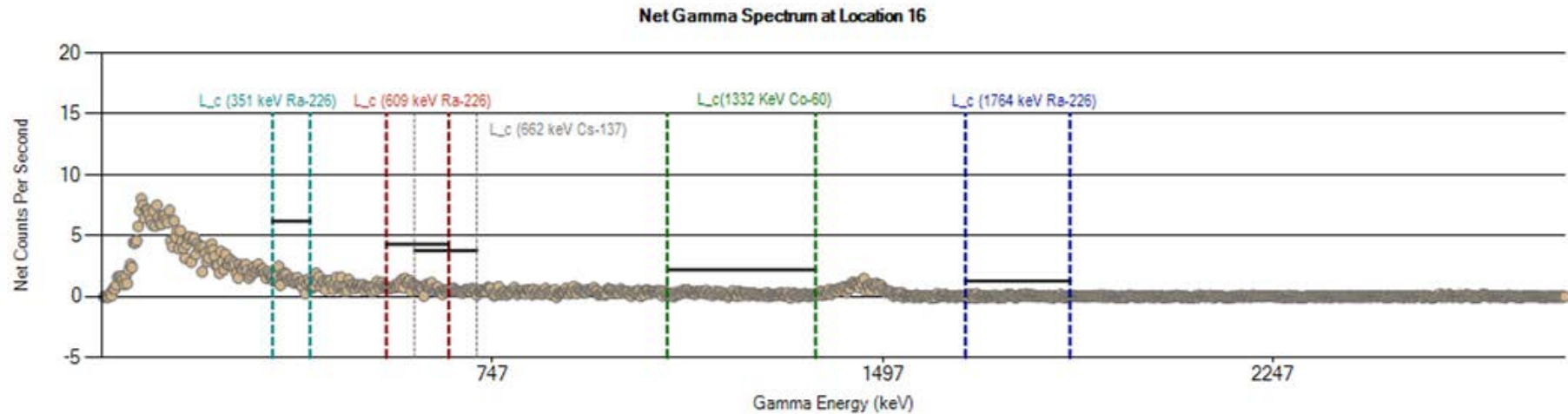


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	946	136	19	26	164	153	118	190	99	3890
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

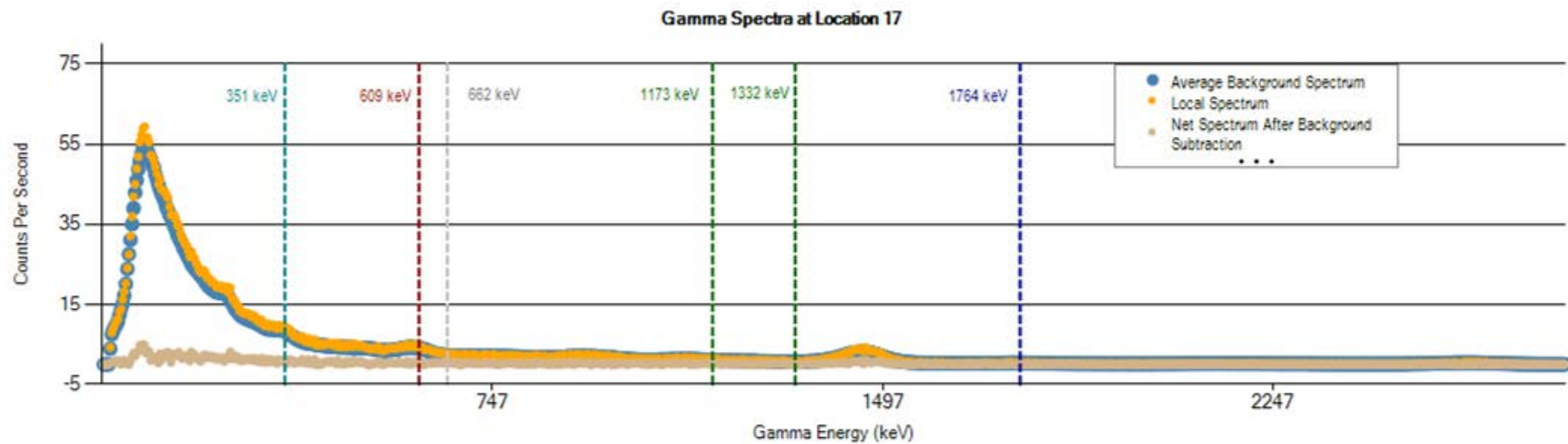
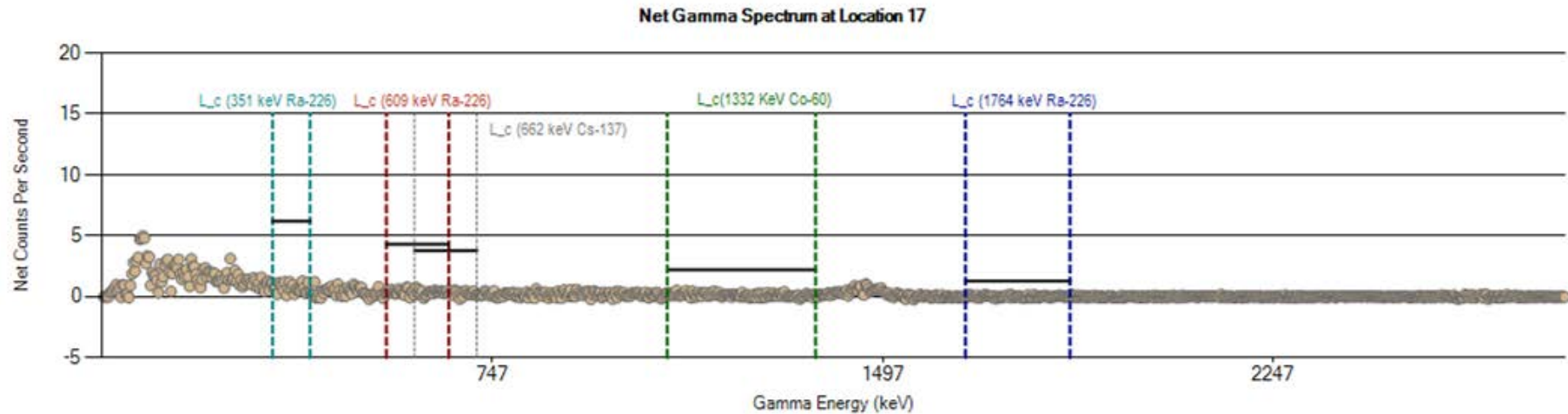


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 15 (cps)	1054	151	24	27	184	172	133	210	111	4201
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

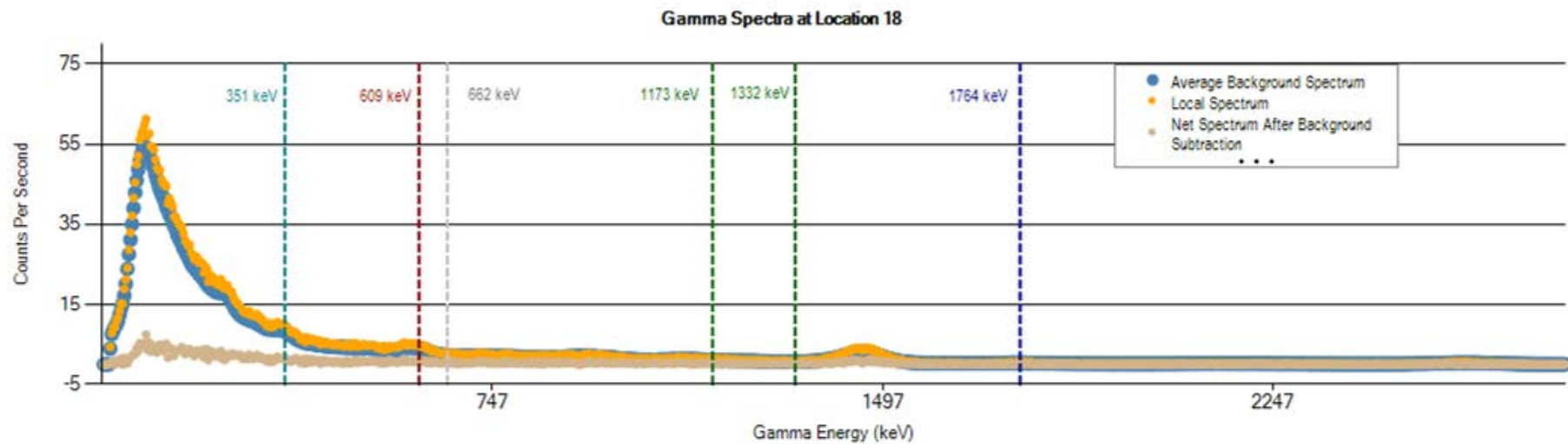
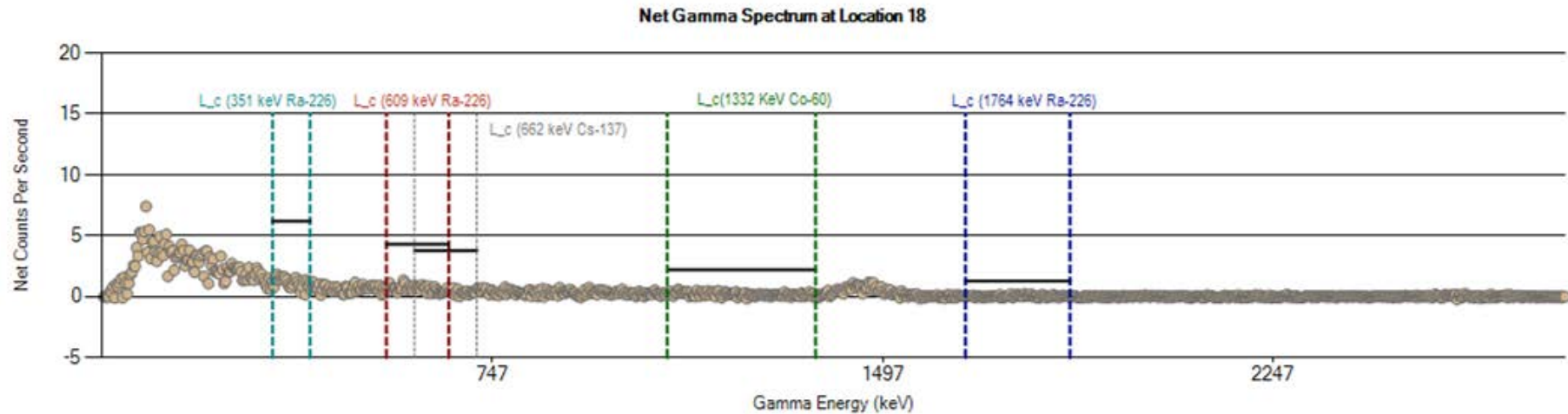




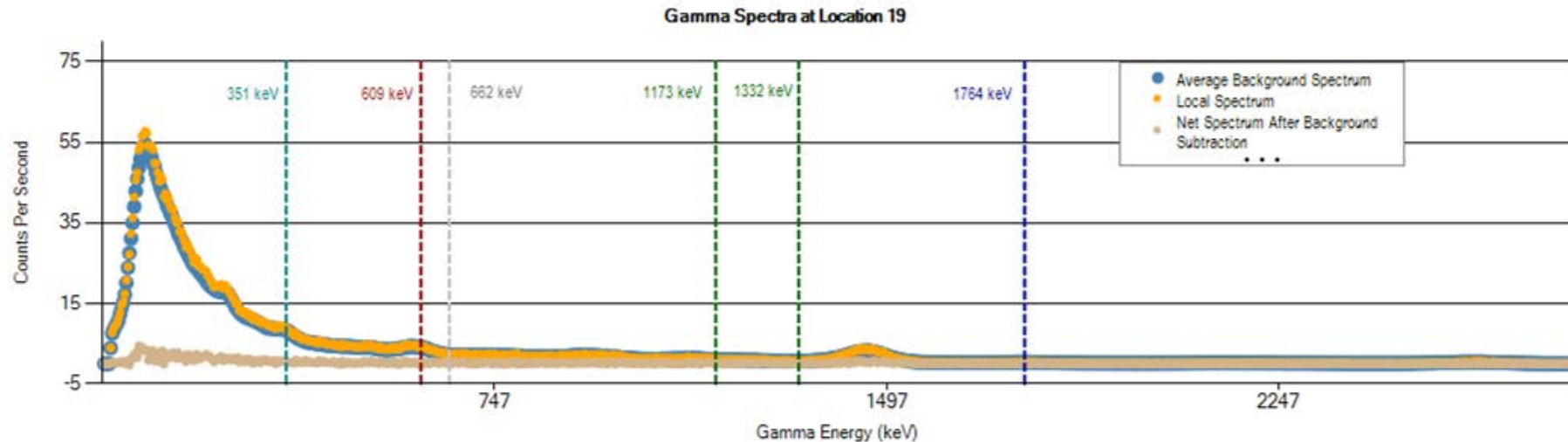
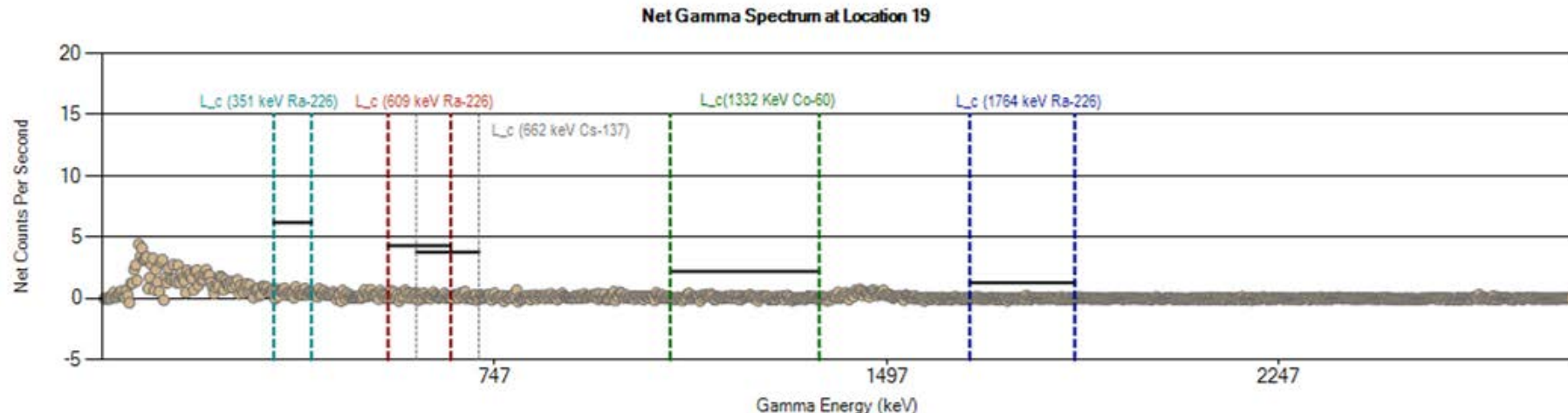
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	1052	149	24	27	184	172	131	208	110	4223
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



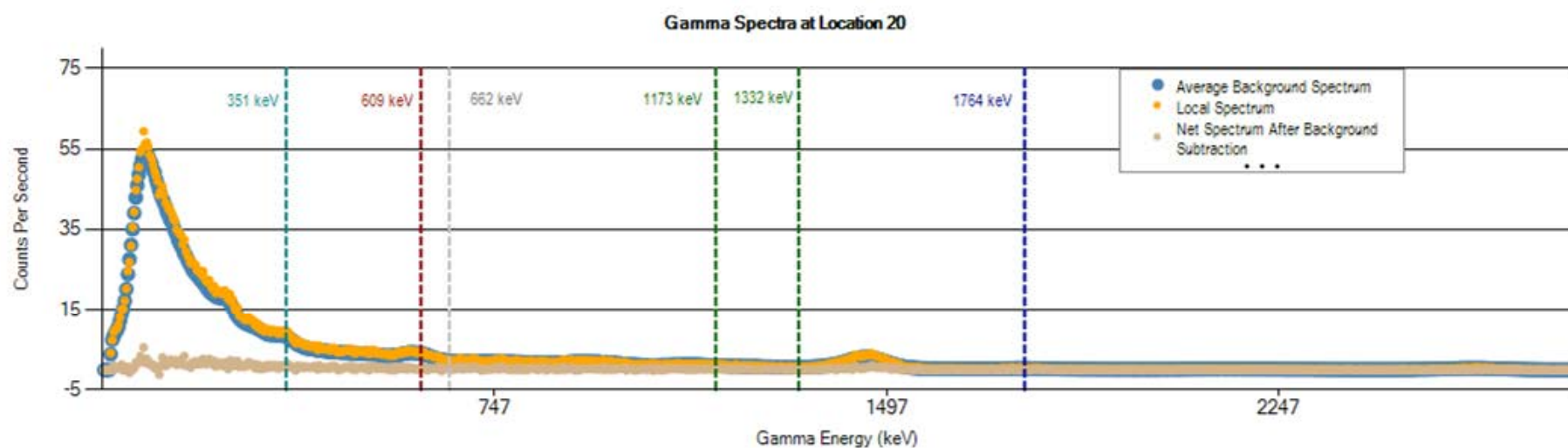
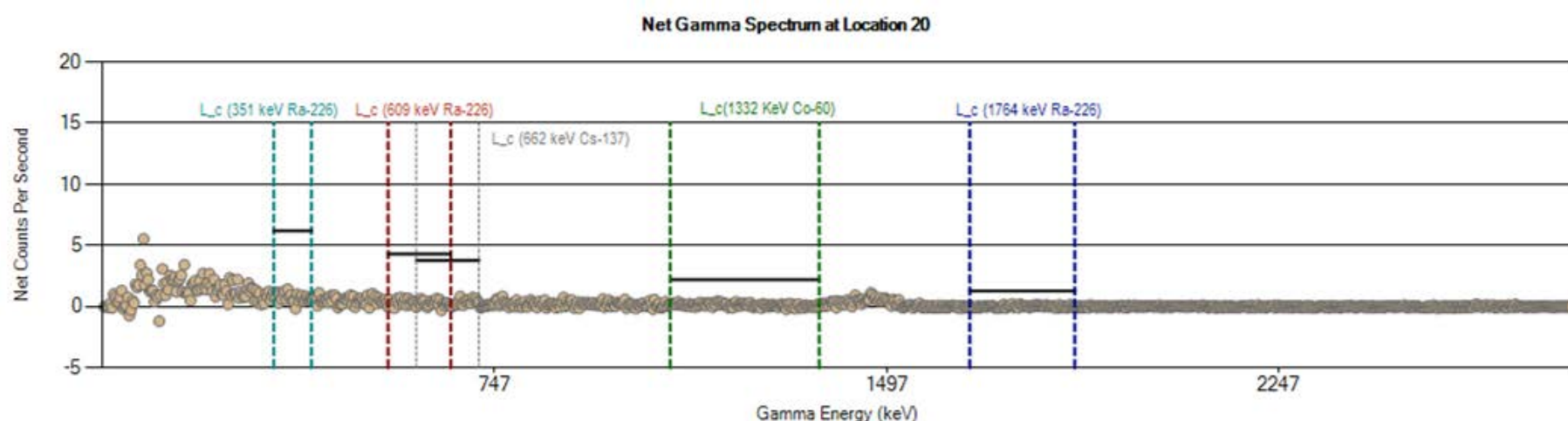
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 17 (cps)	952	136	22	25	165	155	120	191	102	3901
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 18 (cps)	1014	144	23	27	177	167	127	203	108	4070
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

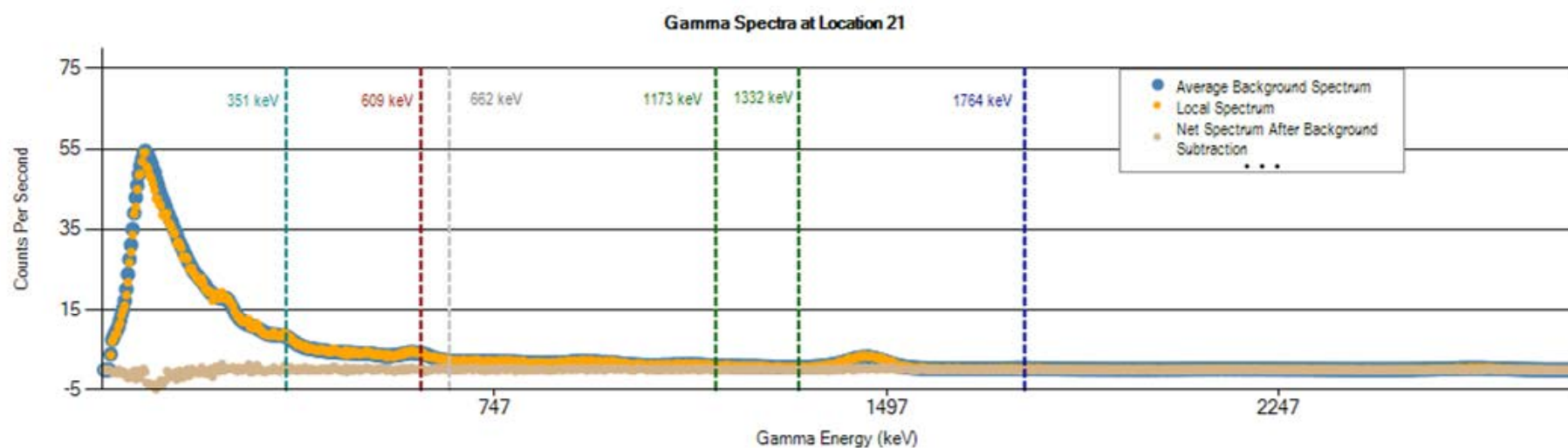
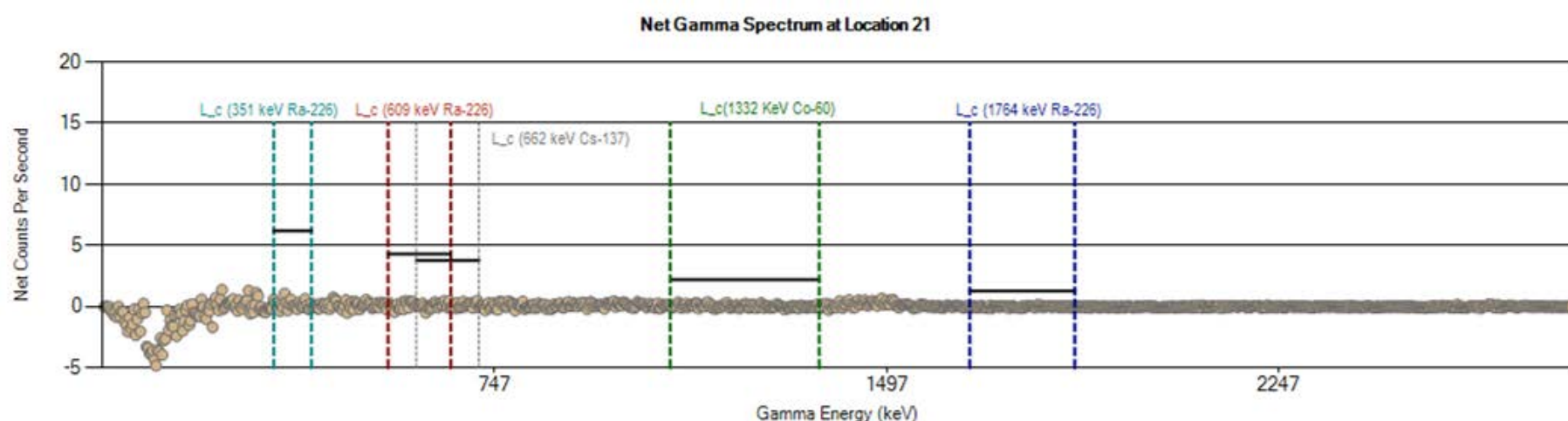


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	923	131	21	25	161	149	115	186	96	3832
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

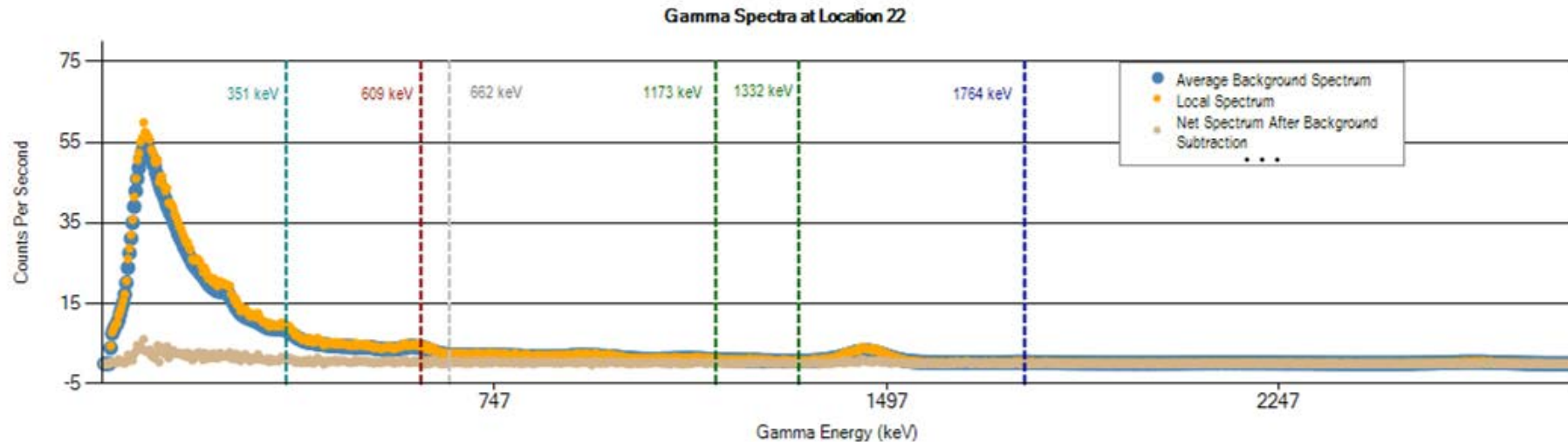
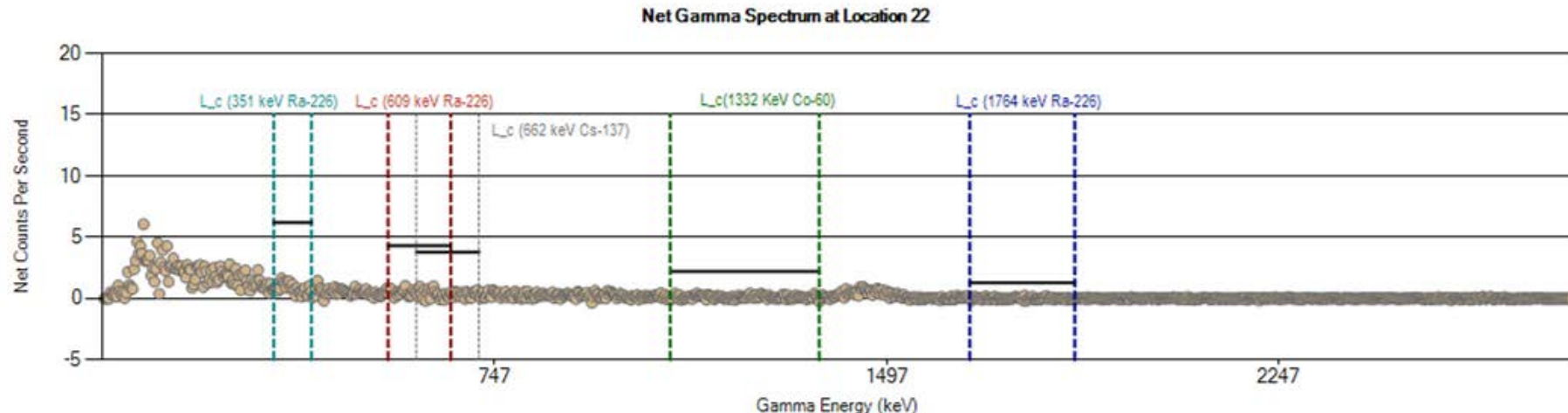


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 20 (cps)	962	137	22	25	169	153	120	193	101	3876
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

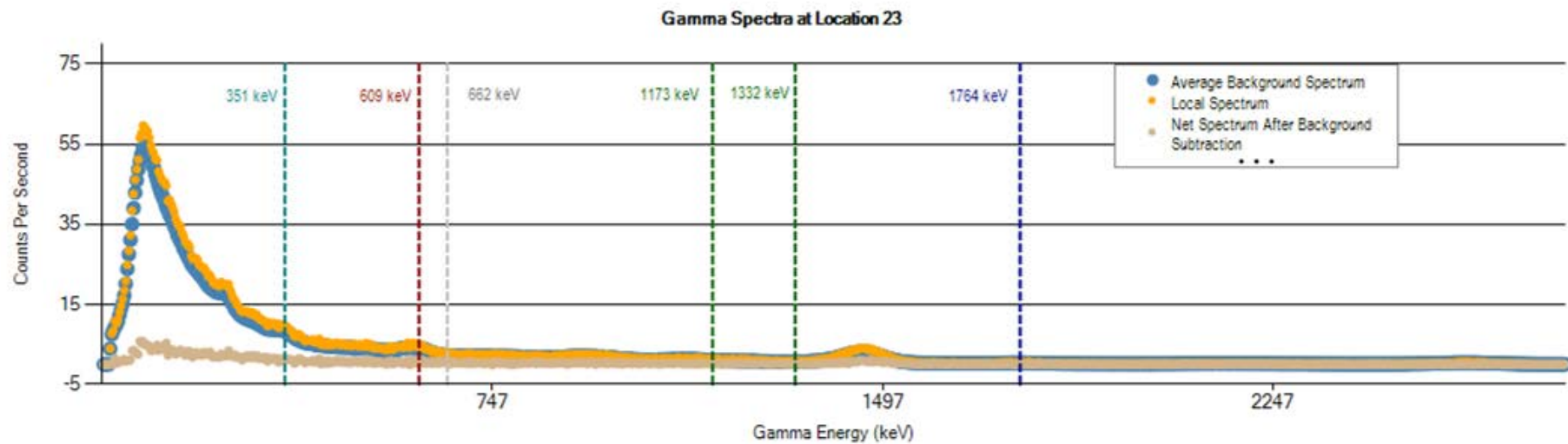
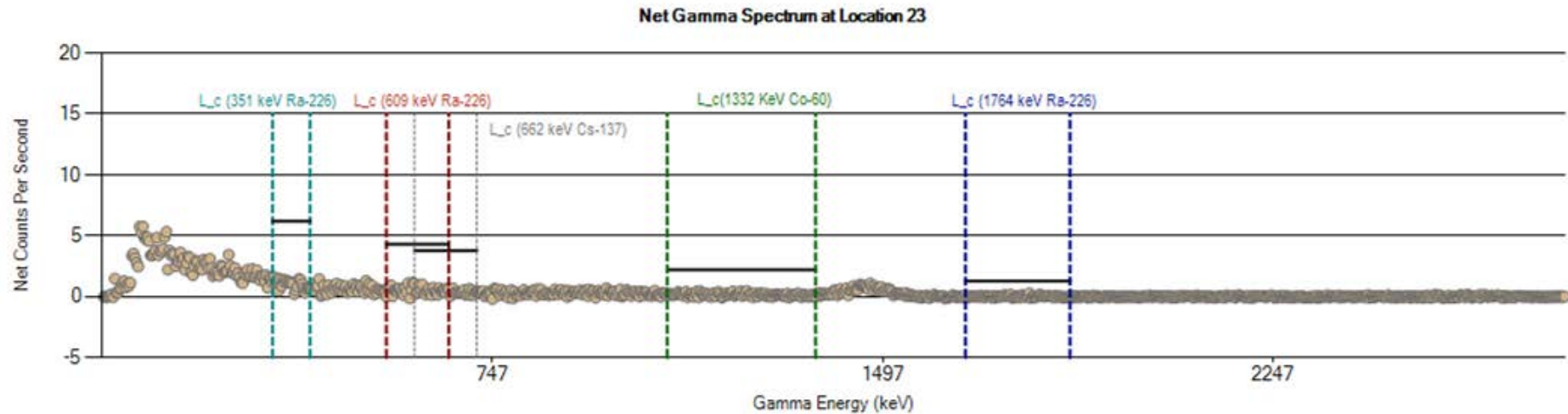




	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 21 (cps)	900	127	21	25	155	144	112	177	93	3579
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

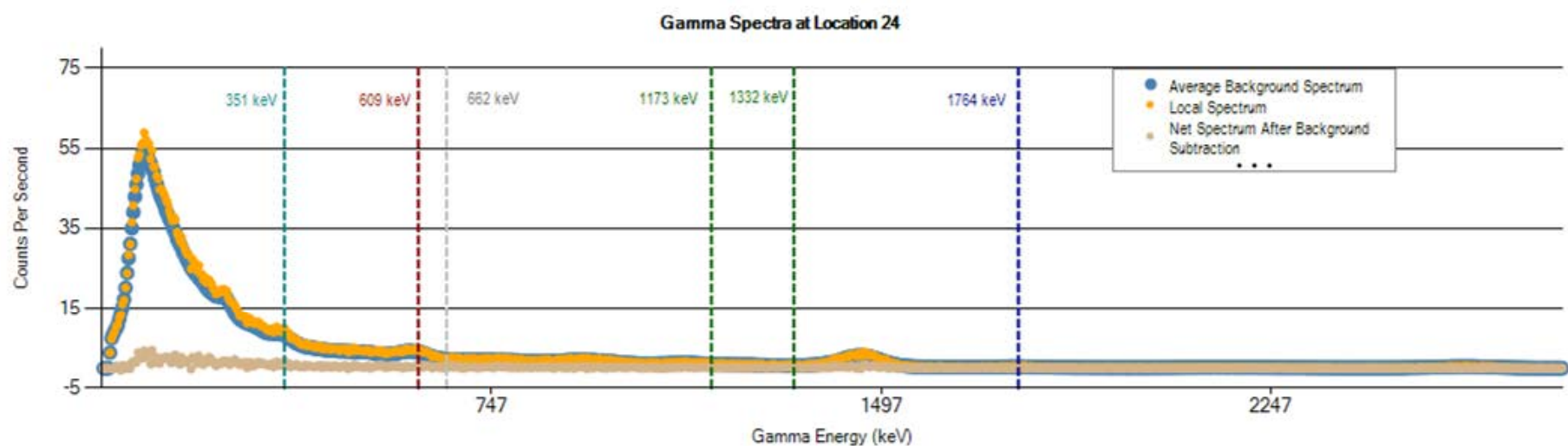
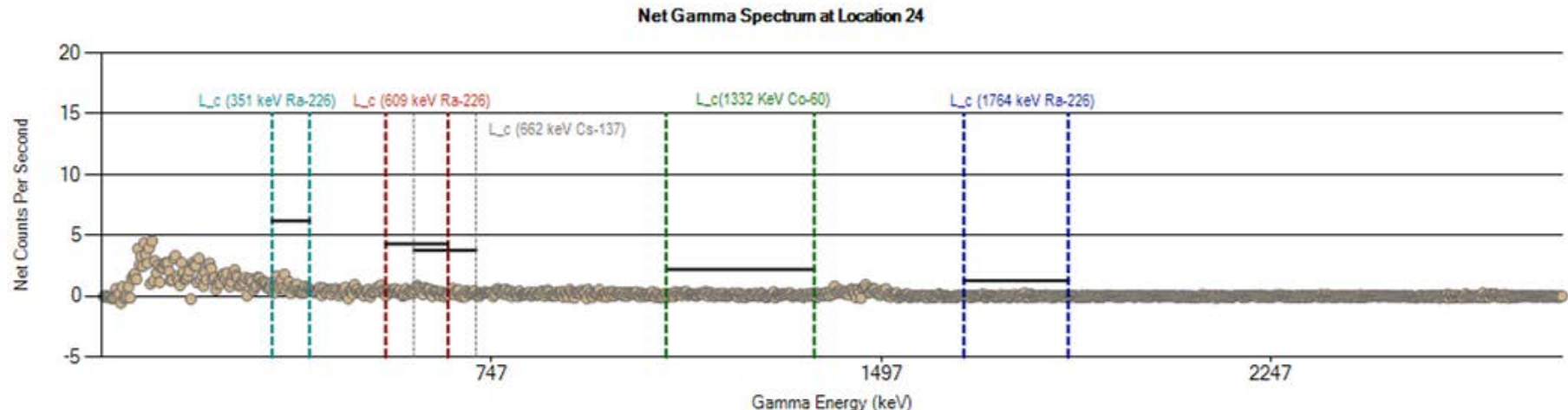


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 22 (cps)	966	136	21	25	170	157	121	194	100	3943
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

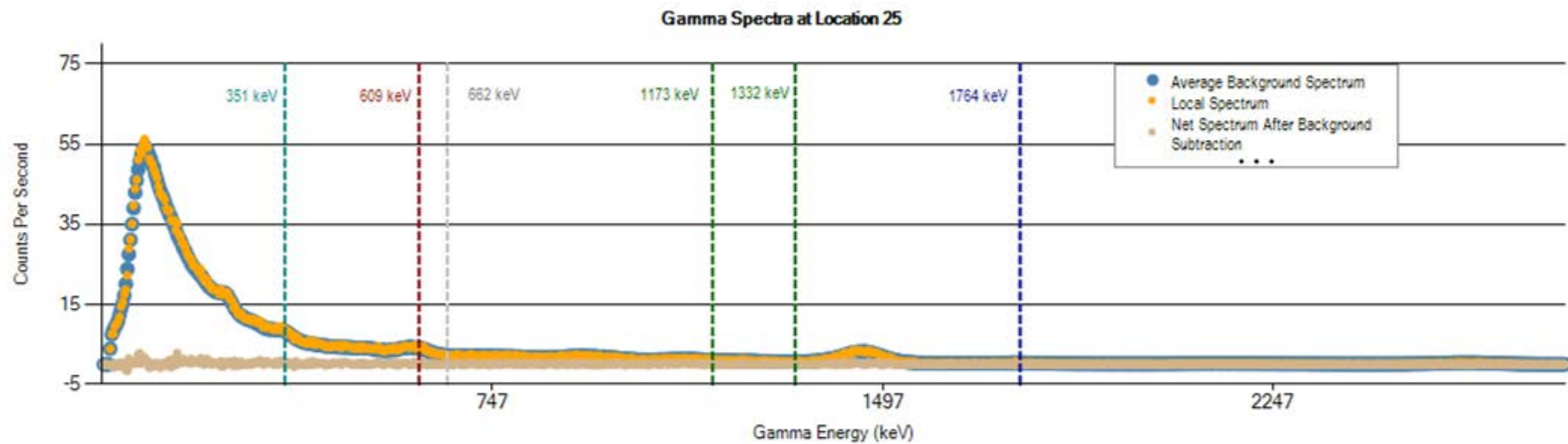
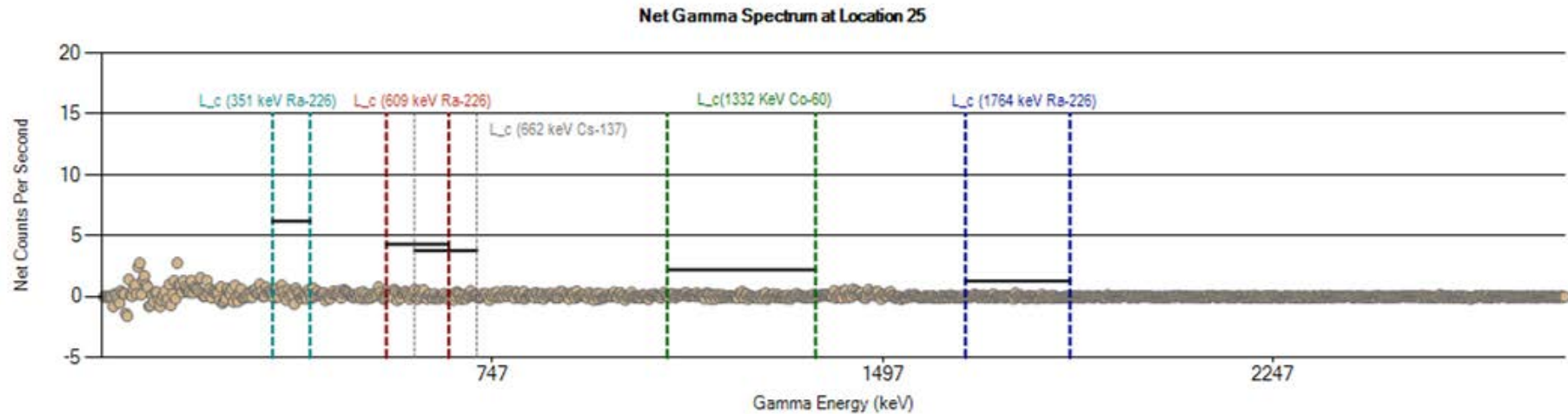


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 23 (cps)	998	143	22	26	175	162	125	199	105	4038
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

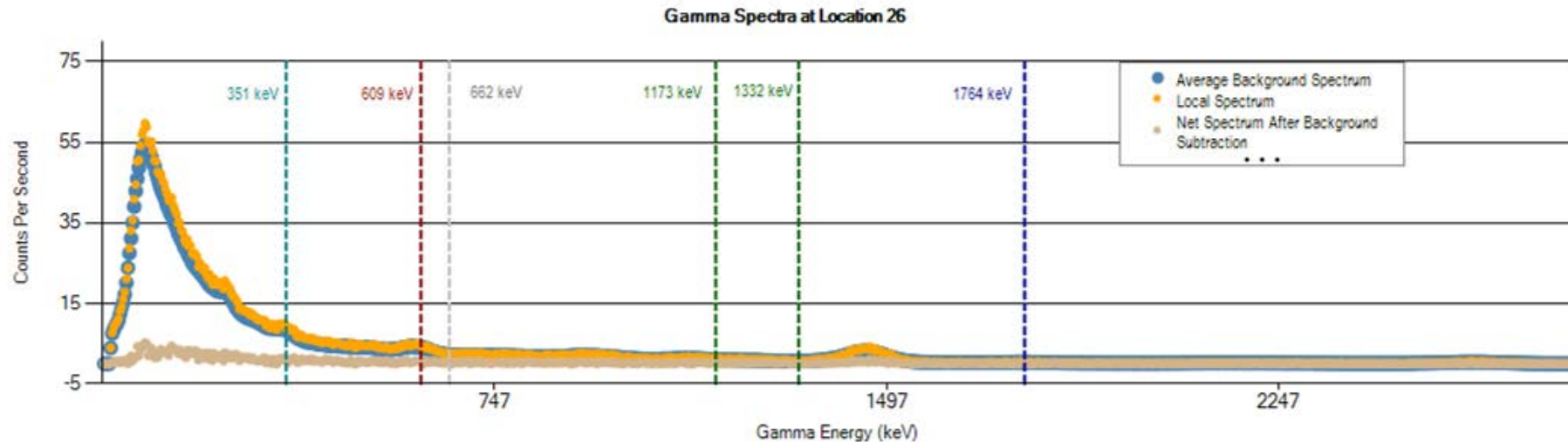
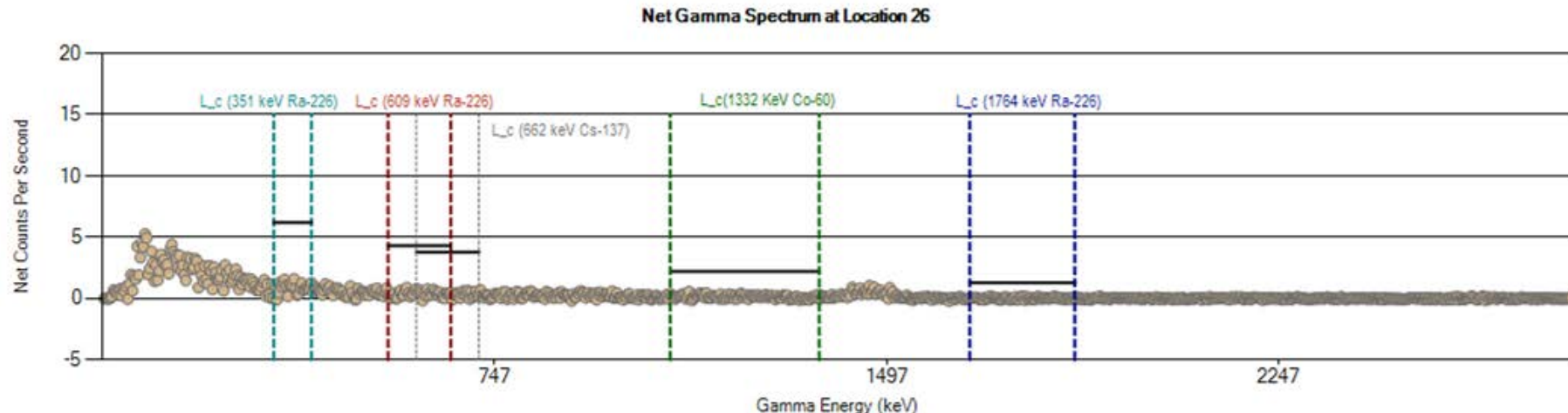




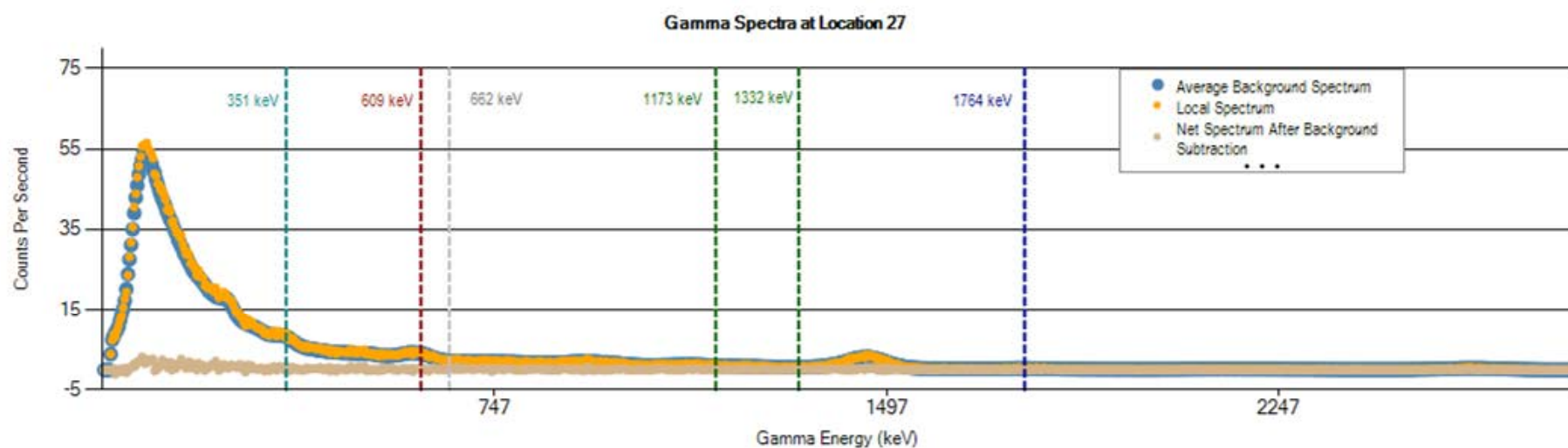
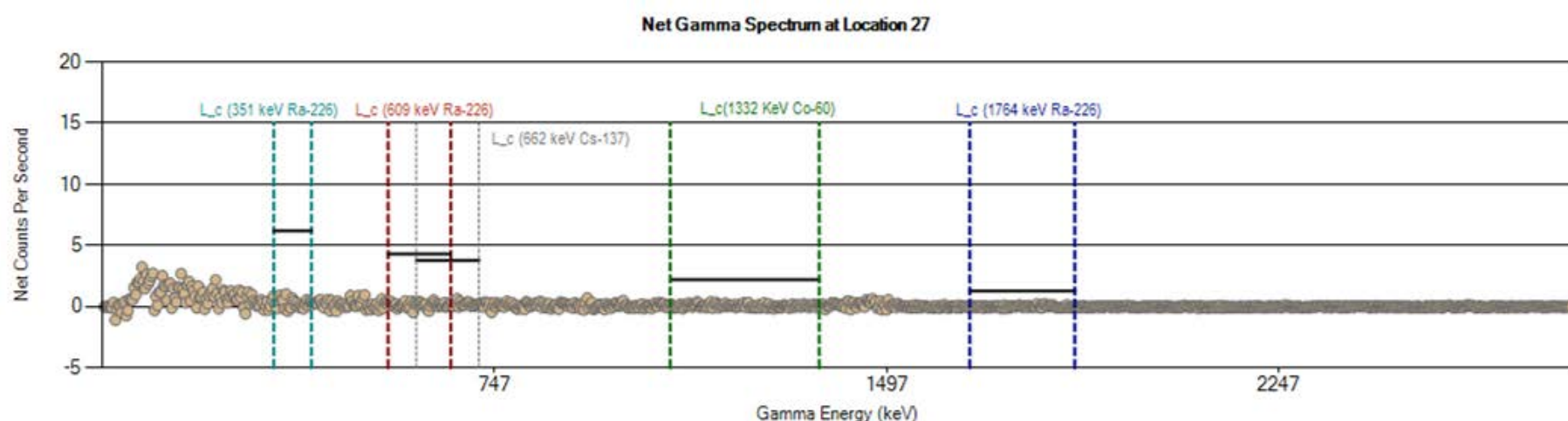
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 24 (cps)	953	132	22	25	168	155	121	193	101	3892
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



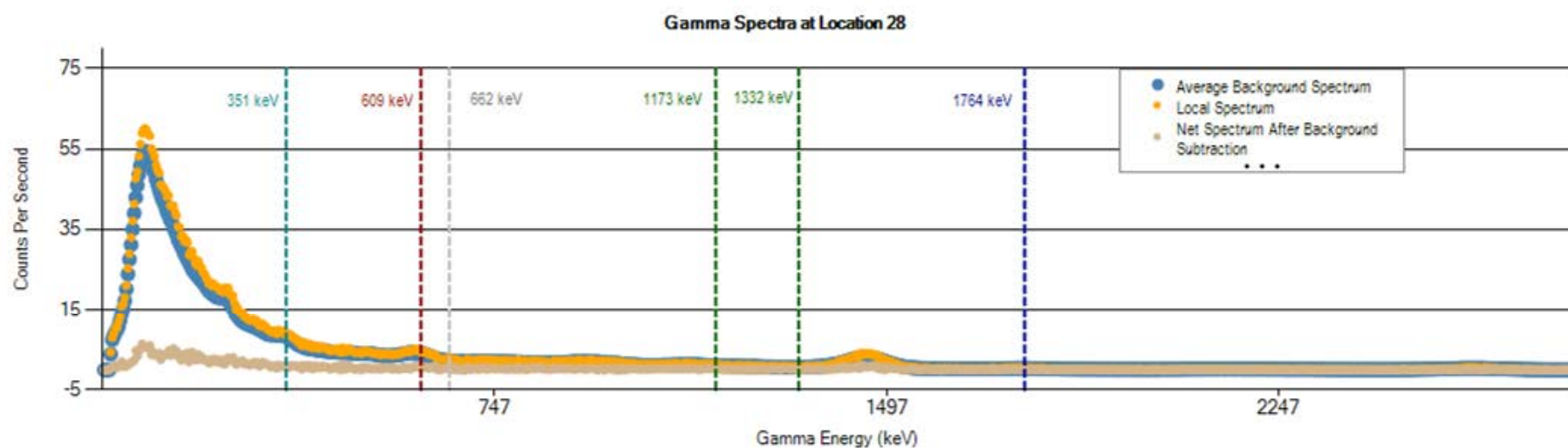
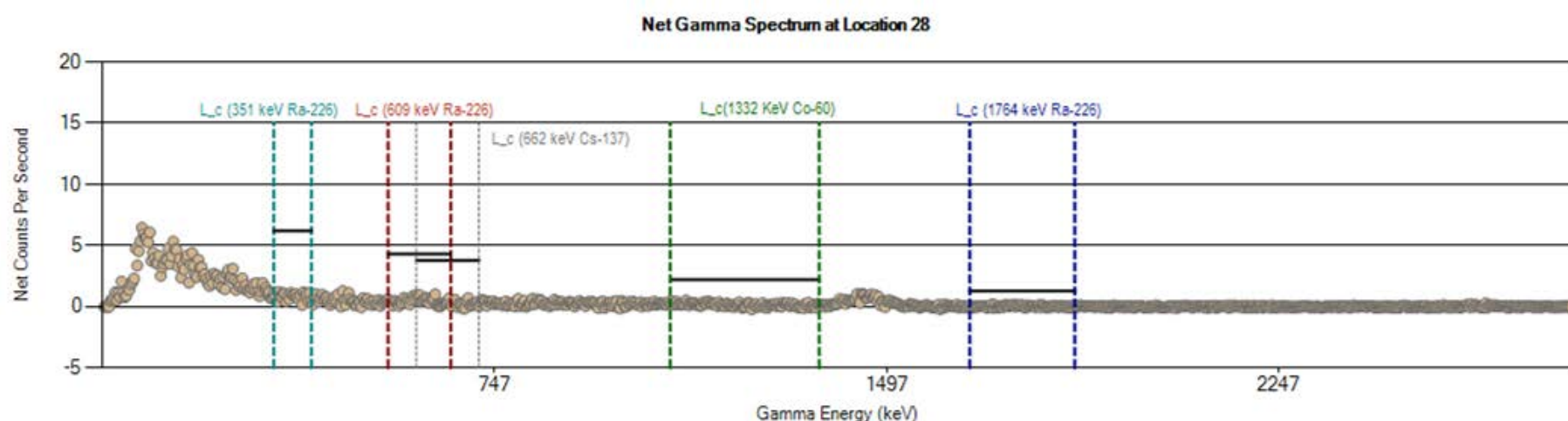
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 25 (cps)	892	123	20	24	158	145	110	179	94	3691
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 26 (cps)	966	134	22	25	167	156	122	197	102	3949
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

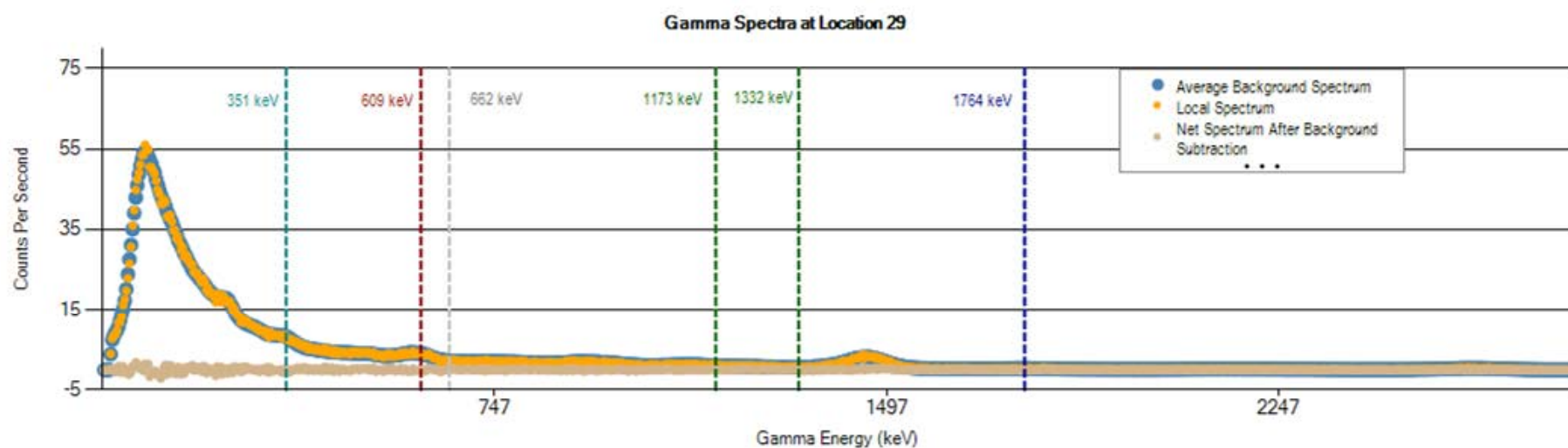
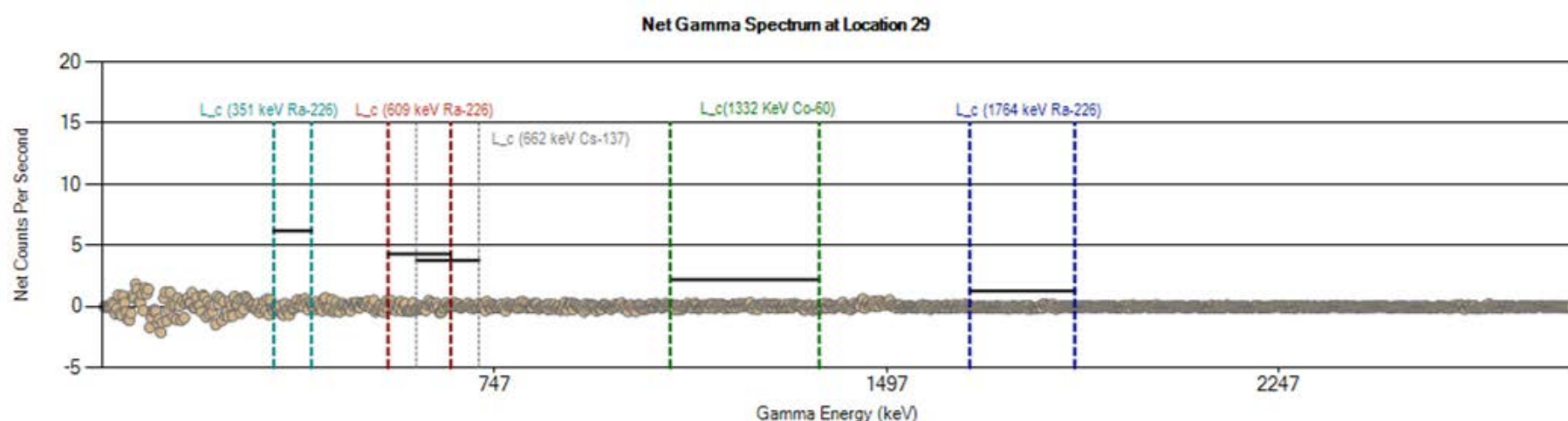


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 27 (cps)	905	124	21	24	159	147	115	181	96	3761
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

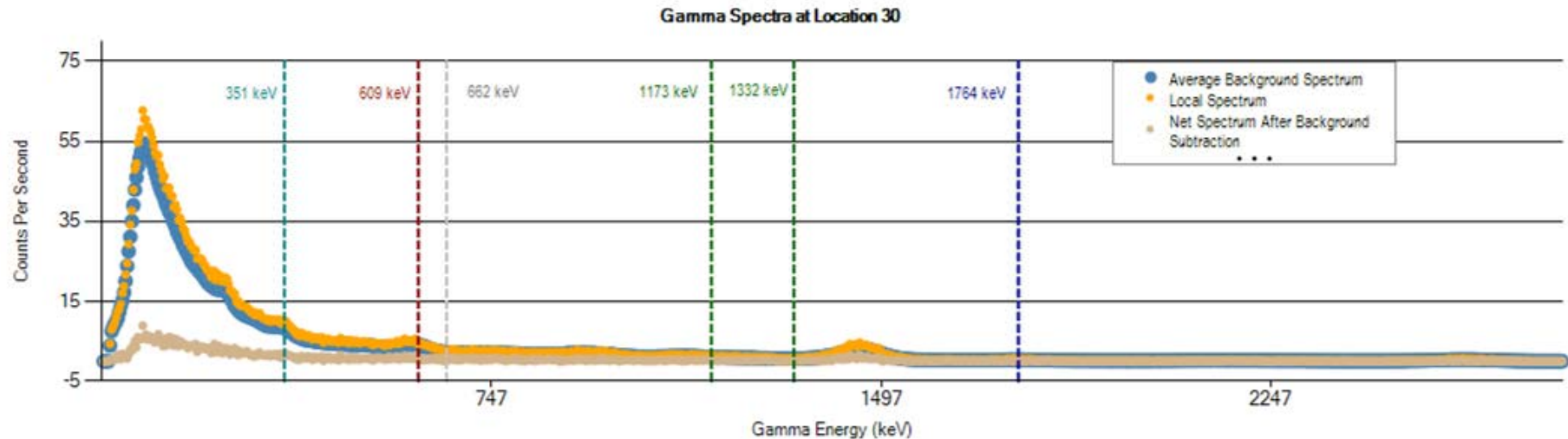
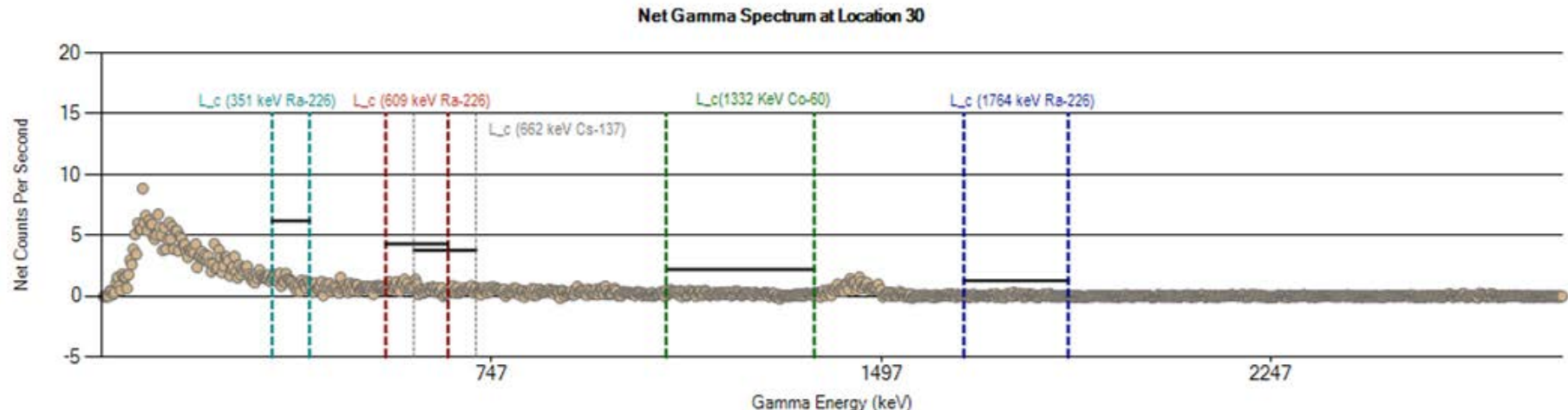


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 28 (cps)	977	139	23	26	167	159	122	194	104	4030
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

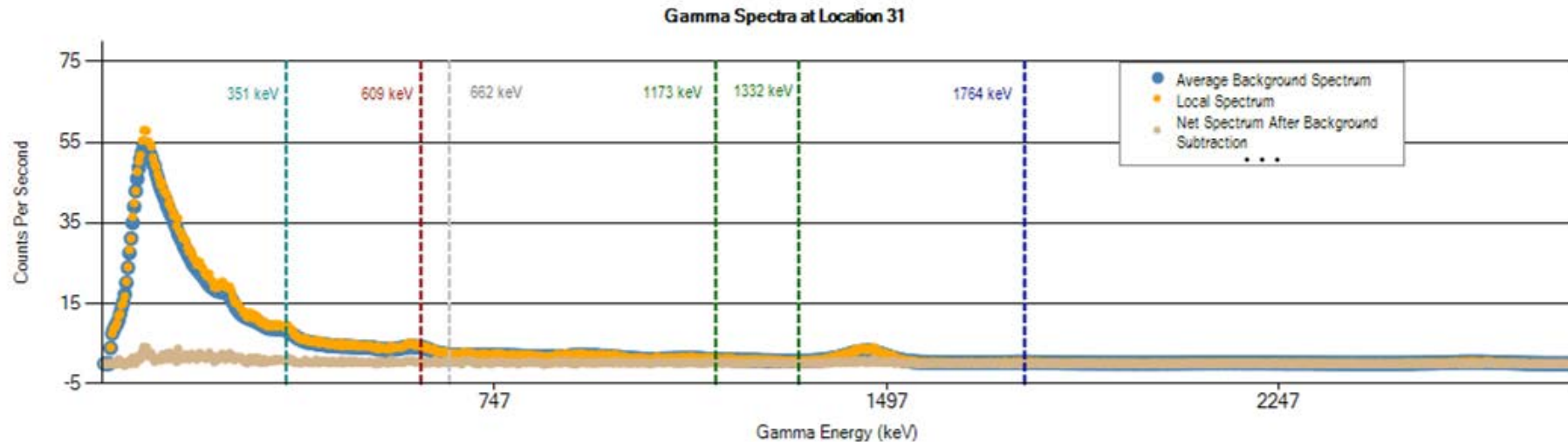
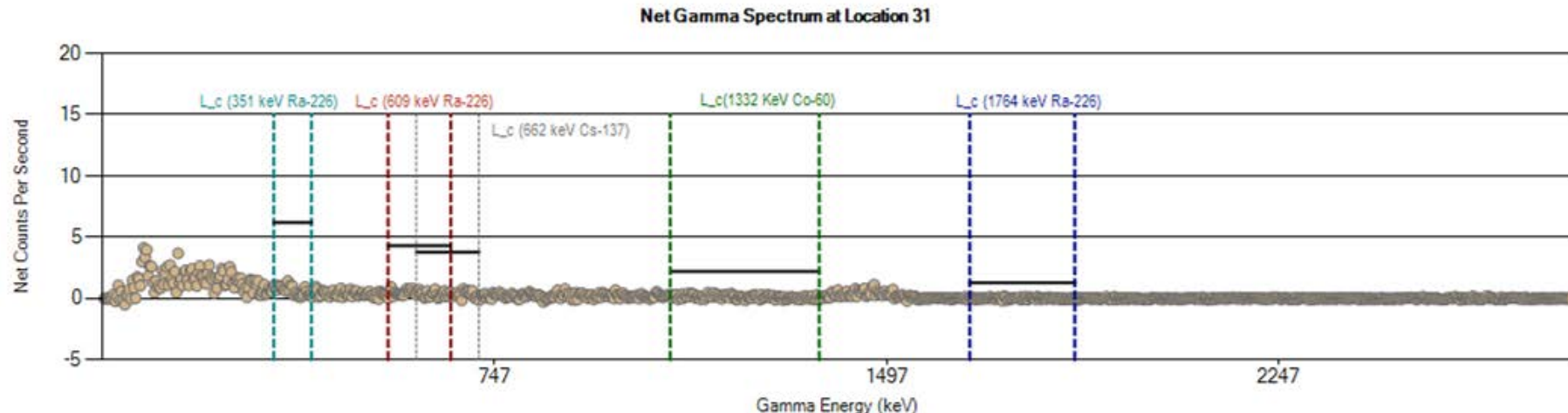




	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 29 (cps)	868	122	19	23	154	140	109	174	92	3627
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

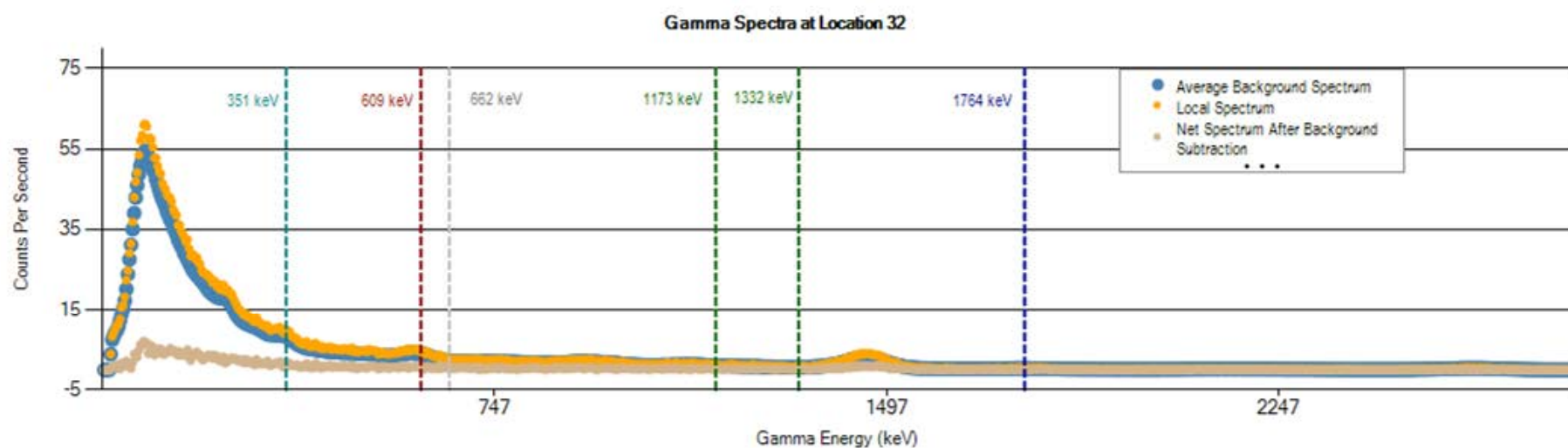
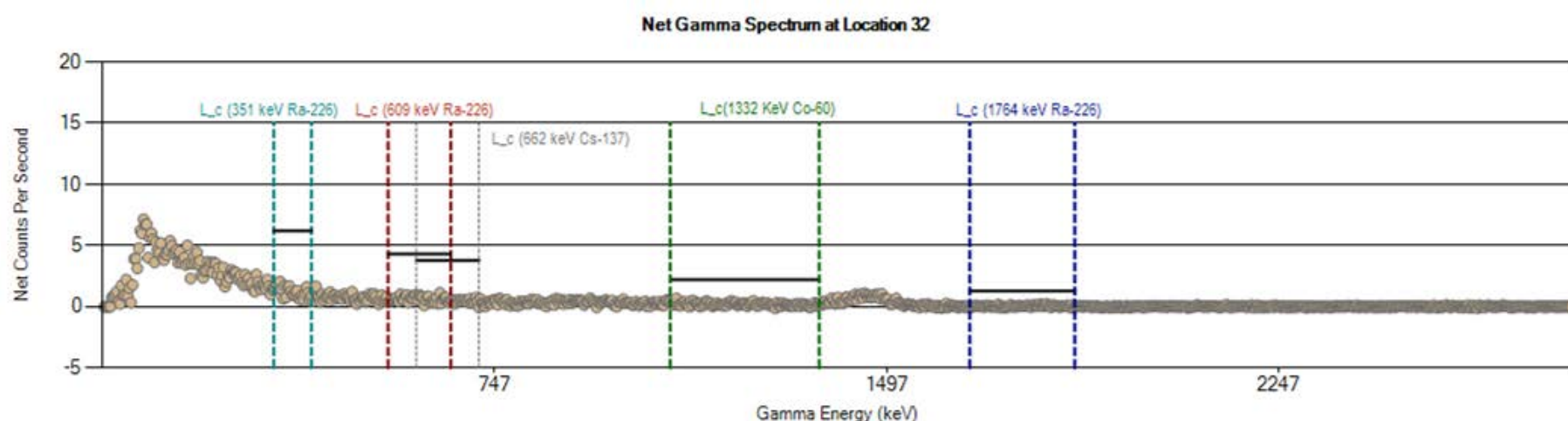


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 30 (cps)	1025	146	24	27	180	167	129	204	107	4149
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

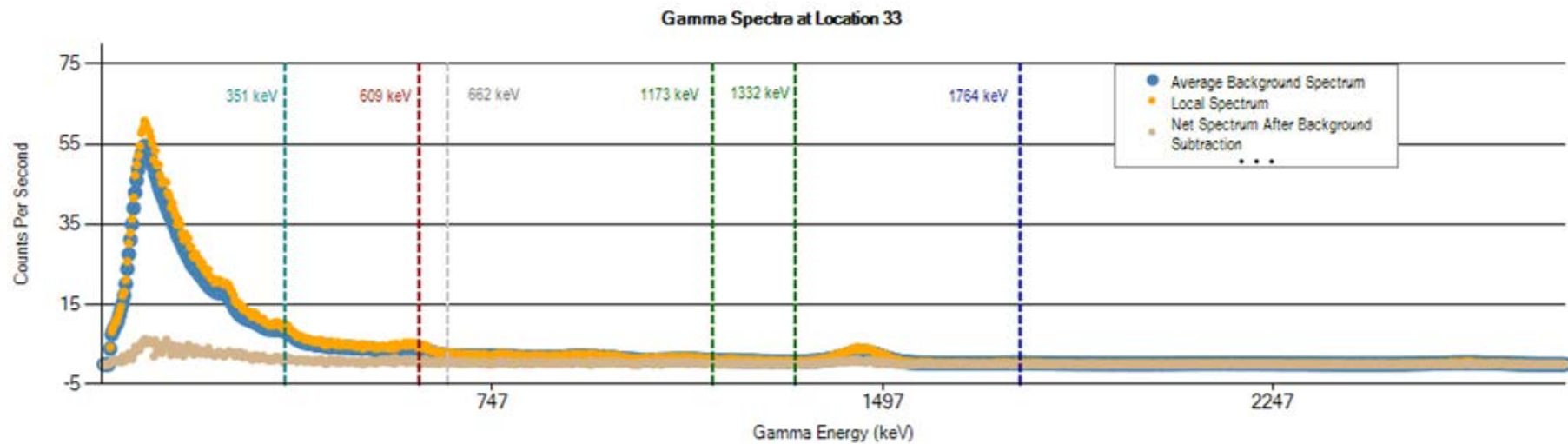
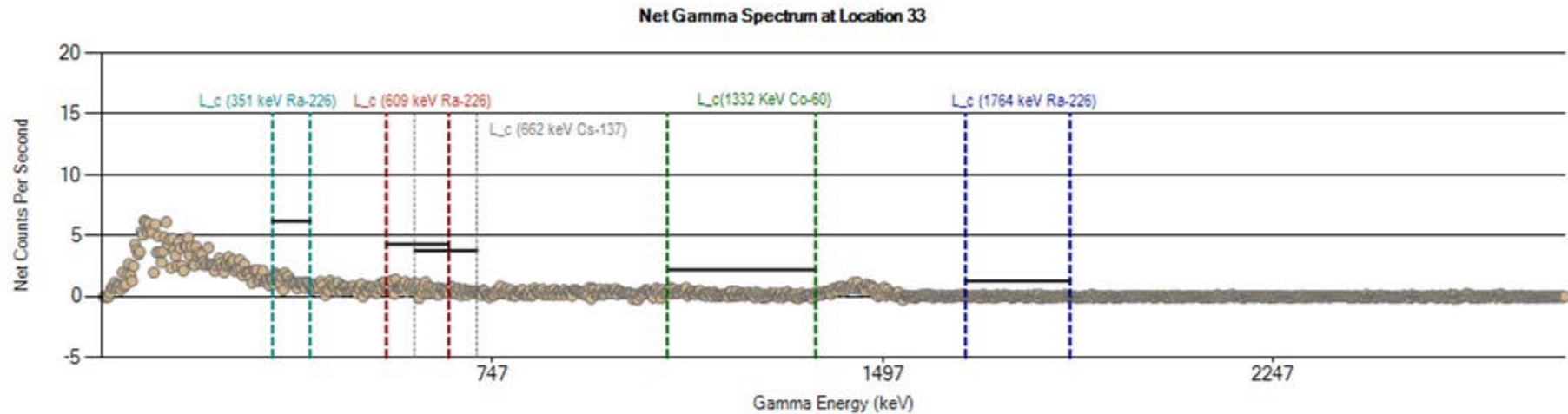


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 31 (cps)	961	135	22	25	166	158	122	190	102	3877
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255





	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 32 (cps)	1024	148	24	26	177	166	129	203	109	4130
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

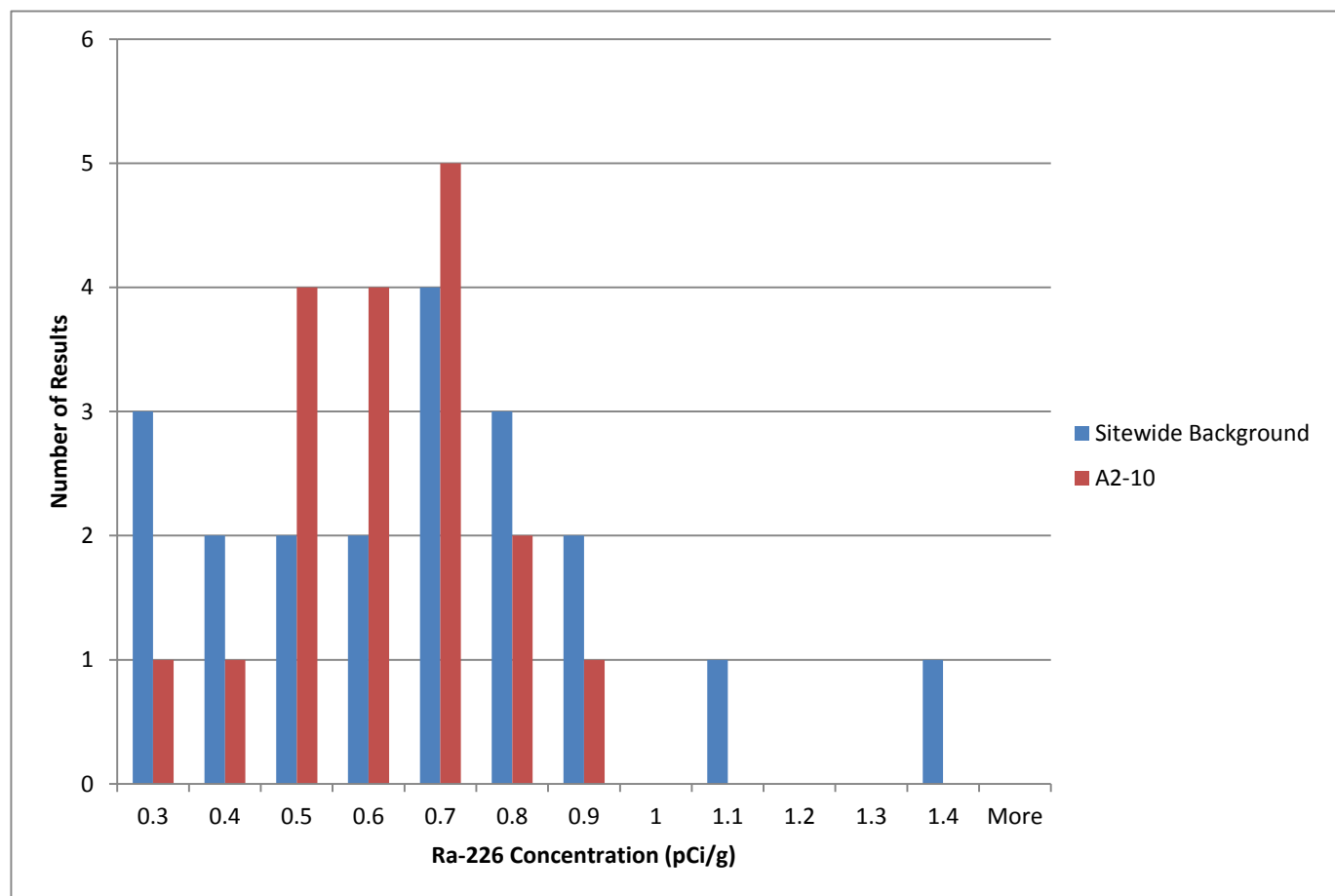


	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 33 (cps)	1018	143	23	26	179	168	128	205	108	4106
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

Histogram, RSY A2 (Use 10) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

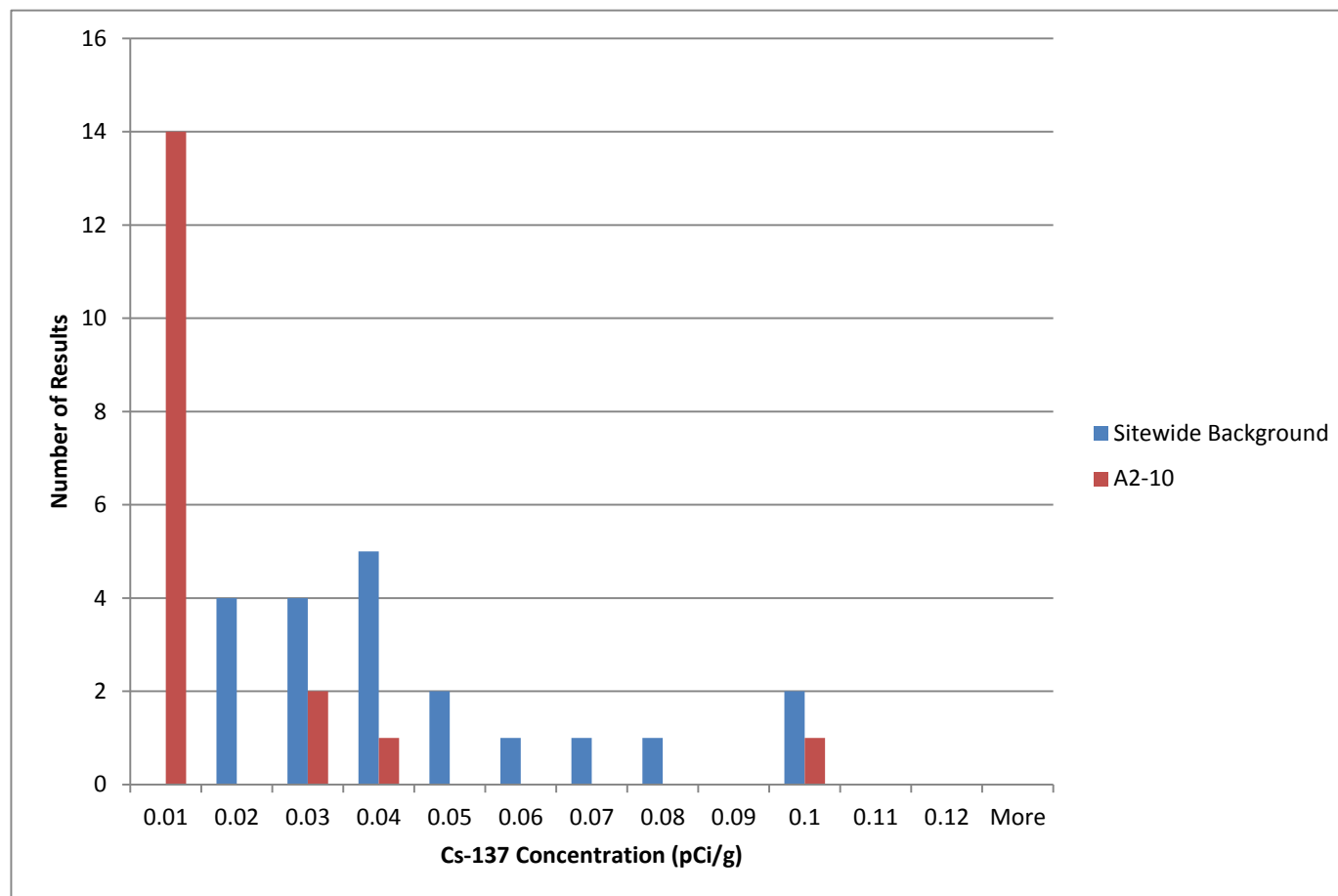
A2-10	
<i>Bin</i>	<i>Frequency</i>
0.3	1
0.4	1
0.5	4
0.6	4
0.7	5
0.8	2
0.9	1
1	0
1.1	0
1.2	0
1.3	0
1.4	0
More	0



Histogram, RSY A2 (Use 10) vs. Sitewide Background

Background	
<i>Bin</i>	<i>Frequency</i>
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

A2-10	
<i>Bin</i>	<i>Frequency</i>
0.01	14
0.02	0
0.03	2
0.04	1
0.05	0
0.06	0
0.07	0
0.08	0
0.09	0
0.1	1
0.11	0
0.12	0
More	0



# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-29330-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Eddie Kalombo

*Rhonda Ridenhower*

Authorized for release by:  
8/2/2018 4:08:51 PM

Rhonda Ridenhower, Manager of Project Management  
(314)298-8566  
[rhonda.ridenhower@testamericainc.com](mailto:rhonda.ridenhower@testamericainc.com)

### LINKS

Review your project  
results through

TotalAccess

Have a Question?



Visit us at:

[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	5
Receipt Checklists . . . . .	7
Definitions/Glossary . . . . .	8
Method Summary . . . . .	9
Sample Summary . . . . .	10
Client Sample Results . . . . .	11
QC Sample Results . . . . .	21
QC Association Summary . . . . .	23
Tracer Carrier Summary . . . . .	24

1

2

3

4

5

6

7

8

9

10

11

12

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Job ID: 160-29330-2**

**Laboratory: TestAmerica St. Louis**

### Narrative

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: Hunters Point Naval Shipyard - Parcel E2**

**Report Number: 160-29330-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

### Job ID: 160-29330-2 (Continued)

#### Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

#### RECEIPT

The samples were received on 07/05/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

#### TOTAL BETA STRONTIUM (GFPC)

Samples PE2-RSYA2-U10-S001 (160-29330-1) and PE2-RSYA2-U10-S011 (160-29330-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 07/05/2018, prepared on 07/09/2018 and analyzed on 07/27/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYA2-U10-S001 (160-29330-1), PE2-RSYA2-U10-S011 (160-29330-11) and (160-29330-A-1-A DU). The samples contained detritus material and rocks of varying sizes.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYA2-U10-S001 (160-29330-1), PE2-RSYA2-U10-S002 (160-29330-2), PE2-RSYA2-U10-S003 (160-29330-3), PE2-RSYA2-U10-S004 (160-29330-4), PE2-RSYA2-U10-S005 (160-29330-5), PE2-RSYA2-U10-S006 (160-29330-6), PE2-RSYA2-U10-S007 (160-29330-7), PE2-RSYA2-U10-S008 (160-29330-8), PE2-RSYA2-U10-S009 (160-29330-9), PE2-RSYA2-U10-S010 (160-29330-10), PE2-RSYA2-U10-S011 (160-29330-11), PE2-RSYA2-U10-S012 (160-29330-12), PE2-RSYA2-U10-S013 (160-29330-13), PE2-RSYA2-U10-S014 (160-29330-14), PE2-RSYA2-U10-S015 (160-29330-15), PE2-RSYA2-U10-S016 (160-29330-16), PE2-RSYA2-U10-S017 (160-29330-17) and PE2-RSYA2-U10-S018 (160-29330-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 07/05/2018, prepared on 07/11/2018 and analyzed on 08/01/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. PE2-RSYA2-U10-S004 (160-29330-4), PE2-RSYA2-U10-S005 (160-29330-5), PE2-RSYA2-U10-S006 (160-29330-6), PE2-RSYA2-U10-S010 (160-29330-10), PE2-RSYA2-U10-S013 (160-29330-13), PE2-RSYA2-U10-S015 (160-29330-15) and PE2-RSYA2-U10-S016 (160-29330-16)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



APTIM Federal Services, LLC  
4005 Port Chicago Hwy  
Concord, CA 94520

## CHAIN OF CUSTODY

Ref. Document # PE2-RSYA2-USE10-FW\_PBOVerEx#547

Page 1 of 2

Project Manager: **Nels Johnson**  
(Name & phone #)

Project Number: 500506

CTO-013 RSYA2 USE 10 Freshwater  
Wetlands and Panhandle Lead Over-  
excavation Systematic

Project Name: HPNS - Parcel E-2

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.2.18

Waybill Number:

Lab Destination: TestAmerica (St. Louis Lab)

Lab Address: 13715 Rider Trail North

Earth City, MO 63045

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Send Report To: **Eddie Kalombo**  
Phone/Fax Number: 415-987-0760  
Address: 4005 Port Chicago Hwy  
City: Concord, CA 94520

Sampler's Name(s): **Edwin Ramirez**

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Preservative (water)			Gamma Spec (EPA 191.1 M) 7 day in-growth preliminary results and full 21 day in-growth for full gamma results	Analyses Requested			Dose Rate µR/hr
		Date	Time	Method			Preservative (soil)	Container Type			Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)		
PE2-RSYA2-U10-S001	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1258	G	SO	1	16 oz. plastic jar			X	X	X		5
PE2-RSYA2-U10-S002	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1259	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S003	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1303	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S004	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1304	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S005	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1307	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S006	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1310	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S007	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1313	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S008	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1316	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S009	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1319	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S010	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1322	G	SO	1	16 oz. plastic jar			X				5



### Special Instructions:

7 days ingrown draft and follow with 21 days final.

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above 0.331 pCi/g.

<input type="checkbox"/> 24-hr		<input type="checkbox"/> 10-day		<input type="checkbox"/> 3-day	
Standard TAT - 10-day		Level Of QC Required:		Project Specific:	
Relinquished By: <b>Edwin Ramirez</b>	Date: 6/29/18 Time: 1100	I	II	III	Received By: <b>Edwin Ramirez</b> Date: 6.29.18 Time: 1100
Relinquished By: <b>Edwin Ramirez</b>	Date: 7.2.18 Time: 1600				Received By: <b>Edwin Ramirez</b> Date: 7.2.18 Time: 0940
Relinquished By:	Date:				Received By:
Relinquished By:	Date:				Received By:
Relinquished By:	Date:				Received By:
		C = Composite		G = Grab	
		Matrix Codes		Matrix Codes	
		DW = Drinking Water		SO = Soil	
		GW = Ground Water		SL = Sludge	
		WW = Waste Water		CP = Chip Samples	
		A = Air		ABS = Asbestos, PO = Pipe Opening	







## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29330-2

**Login Number: 29330****List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Method Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

**Protocol References:**

- DOE = U.S. Department of Energy
- None = None

**Laboratory References:**

- TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

# Sample Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29330-1	PE2-RSYA2-U10-S001	Solid	06/29/18 12:58	07/05/18 08:40
160-29330-2	PE2-RSYA2-U10-S002	Solid	06/29/18 12:59	07/05/18 08:40
160-29330-3	PE2-RSYA2-U10-S003	Solid	06/29/18 13:03	07/05/18 08:40
160-29330-4	PE2-RSYA2-U10-S004	Solid	06/29/18 13:04	07/05/18 08:40
160-29330-5	PE2-RSYA2-U10-S005	Solid	06/29/18 13:07	07/05/18 08:40
160-29330-6	PE2-RSYA2-U10-S006	Solid	06/29/18 13:10	07/05/18 08:40
160-29330-7	PE2-RSYA2-U10-S007	Solid	06/29/18 13:13	07/05/18 08:40
160-29330-8	PE2-RSYA2-U10-S008	Solid	06/29/18 13:16	07/05/18 08:40
160-29330-9	PE2-RSYA2-U10-S009	Solid	06/29/18 13:19	07/05/18 08:40
160-29330-10	PE2-RSYA2-U10-S010	Solid	06/29/18 13:22	07/05/18 08:40
160-29330-11	PE2-RSYA2-U10-S011	Solid	06/29/18 13:25	07/05/18 08:40
160-29330-12	PE2-RSYA2-U10-S012	Solid	06/29/18 13:28	07/05/18 08:40
160-29330-13	PE2-RSYA2-U10-S013	Solid	06/29/18 13:31	07/05/18 08:40
160-29330-14	PE2-RSYA2-U10-S014	Solid	06/29/18 13:35	07/05/18 08:40
160-29330-15	PE2-RSYA2-U10-S015	Solid	06/29/18 13:39	07/05/18 08:40
160-29330-16	PE2-RSYA2-U10-S016	Solid	06/29/18 13:43	07/05/18 08:40
160-29330-17	PE2-RSYA2-U10-S017	Solid	06/29/18 13:47	07/05/18 08:40
160-29330-18	PE2-RSYA2-U10-S018	Solid	06/29/18 13:52	07/05/18 08:40

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S001**

**Date Collected: 06/29/18 12:58**

**Date Received: 07/05/18 08:40**

**Lab Sample ID: 160-29330-1**

**Matrix: Solid**

## Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0183	U	0.0600	0.0600	0.331	0.0478	pCi/g	07/09/18 09:31	07/27/18 11:26	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	92.6		40 - 110					07/09/18 09:31	07/27/18 11:26	1

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.857</b>		0.208	0.226		0.127	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Actinium-227	-0.422	U	1.22	1.22		0.828	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Bismuth-212	0.446	U	0.997	0.998		0.771	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Bismuth-214</b>	<b>0.708</b>		0.237	0.248		0.0967	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Cesium-137	-0.00379	U	0.184	0.184	0.0700	0.0650	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Cobalt-60</b>	<b>0.0783</b>		0.0495	0.0501	0.200	0.0182	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Lead-210	-0.982	U	2.50	2.51		1.83	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Lead-212</b>	<b>0.873</b>		0.169	0.203		0.0843	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Lead-214</b>	<b>0.762</b>		0.176	0.193		0.0810	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Potassium-40</b>	<b>12.4</b>		2.07	2.43		0.518	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Protactinium-231	-0.0000006	U	3.60	3.60		2.97	pCi/g	07/11/18 02:14	08/01/18 07:45	1
	94									
<b>Radium-226</b>	<b>0.708</b>		0.237	0.248	0.700	0.0967	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Radium-228</b>	<b>0.857</b>		0.208	0.226		0.127	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Thallium-208</b>	<b>0.353</b>		0.0907	0.0978		0.0277	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Thorium-228</b>	<b>0.873</b>		0.169	0.203		0.0843	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Thorium-232</b>	<b>0.857</b>		0.208	0.226		0.127	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Thorium-234</b>	<b>1.56</b>		2.11	2.12		1.36	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Uranium-235	-0.335	U	0.472	0.473		0.564	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Uranium-238</b>	<b>1.56</b>		2.11	2.12		1.36	pCi/g	07/11/18 02:14	08/01/18 07:45	1

**Client Sample ID: PE2-RSYA2-U10-S002**

**Date Collected: 06/29/18 12:59**

**Date Received: 07/05/18 08:40**

**Lab Sample ID: 160-29330-2**

**Matrix: Solid**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.431</b>		0.404	0.407		0.226	pCi/g	07/11/18 02:14	08/01/18 14:06	1
Actinium-227	-0.00773	U	0.0335	0.0335		0.838	pCi/g	07/11/18 02:14	08/01/18 14:06	1
Bismuth-212	0.000	U	0.844	0.844		0.901	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Bismuth-214</b>	<b>0.627</b>		0.233	0.242		0.0871	pCi/g	07/11/18 02:14	08/01/18 14:06	1
Cesium-137	-0.0251	U	0.0845	0.0845	0.0700	0.0672	pCi/g	07/11/18 02:14	08/01/18 14:06	1
Cobalt-60	0.00581	U	0.0390	0.0390	0.200	0.0615	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Lead-210</b>	<b>1.04</b>		1.55	1.55		0.977	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Lead-212</b>	<b>0.609</b>		0.142	0.163		0.0843	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Lead-214</b>	<b>0.803</b>		0.159	0.180		0.0562	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Potassium-40</b>	<b>10.3</b>		1.86	2.13		0.350	pCi/g	07/11/18 02:14	08/01/18 14:06	1



# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S002**

**Lab Sample ID: 160-29330-2**

Date Collected: 06/29/18 12:59

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Protactinium-231	-1.05	U	3.78	3.79		3.08	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Radium-226</b>	<b>0.627</b>		0.233	0.242	0.700	0.0871	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Radium-228</b>	<b>0.431</b>		0.404	0.407		0.226	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Thallium-208</b>	<b>0.292</b>		0.0751	0.0810		0.0190	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Thorium-228</b>	<b>0.609</b>		0.142	0.163		0.0843	pCi/g	07/11/18 02:14	08/01/18 14:06	1
<b>Thorium-232</b>	<b>0.431</b>		0.404	0.407		0.226	pCi/g	07/11/18 02:14	08/01/18 14:06	1
Thorium-234	-0.217	U	1.91	1.91		1.28	pCi/g	07/11/18 02:14	08/01/18 14:06	1
Uranium-235	-0.209	U	0.254	0.255		0.550	pCi/g	07/11/18 02:14	08/01/18 14:06	1
Uranium-238	-0.217	U	1.91	1.91		1.28	pCi/g	07/11/18 02:14	08/01/18 14:06	1

**Client Sample ID: PE2-RSYA2-U10-S003**

**Lab Sample ID: 160-29330-3**

Date Collected: 06/29/18 13:03

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>1.24</b>		0.245	0.276		0.0438	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Actinium-227	0.403	U	1.05	1.05		0.845	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Bismuth-212	-0.444	U	1.05	1.05		1.01	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Bismuth-214</b>	<b>0.417</b>		0.139	0.146		0.0479	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Cesium-137	0.0141	U	0.0847	0.0847	0.0700	0.0680	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Cobalt-60	-0.0406	U	0.0924	0.0925	0.200	0.0643	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Lead-210	-1.31	U	0.978	0.990		2.13	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Lead-212</b>	<b>0.776</b>		0.131	0.165		0.0517	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Lead-214</b>	<b>0.642</b>		0.135	0.150		0.0728	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Potassium-40</b>	<b>11.8</b>		2.11	2.43		0.527	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Protactinium-231	0.000	U	0.869	0.869		2.92	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Radium-226</b>	<b>0.417</b>		0.139	0.146	0.700	0.0479	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Radium-228</b>	<b>1.24</b>		0.245	0.276		0.0438	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Thallium-208</b>	<b>0.269</b>		0.0979	0.102		0.0378	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Thorium-228</b>	<b>0.776</b>		0.131	0.165		0.0517	pCi/g	07/11/18 02:14	08/01/18 07:41	1
<b>Thorium-232</b>	<b>1.24</b>		0.245	0.276		0.0438	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Thorium-234	-0.911	U	1.95	1.95		1.64	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Uranium-235	0.0548	U	0.140	0.140		0.509	pCi/g	07/11/18 02:14	08/01/18 07:41	1
Uranium-238	-0.911	U	1.95	1.95		1.64	pCi/g	07/11/18 02:14	08/01/18 07:41	1

**Client Sample ID: PE2-RSYA2-U10-S004**

**Lab Sample ID: 160-29330-4**

Date Collected: 06/29/18 13:04

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.769</b>		0.205	0.219		0.101	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Actinium-227	-0.127	U	0.983	0.983		0.804	pCi/g	07/11/18 02:14	08/01/18 07:43	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S004**

**Lab Sample ID: 160-29330-4**

**Date Collected: 06/29/18 13:04**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-212	0.0555	U	0.987	0.987		0.808	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Bismuth-214</b>	<b>0.531</b>		0.154	0.164		0.0490	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Cesium-137	-0.0724	U	0.121	0.121	0.0700	0.0952	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Cobalt-60	0.0128	U	0.0118	0.0119	0.200	0.0408	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Lead-210	0.243	U	1.69	1.69		1.37	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Lead-212</b>	<b>0.603</b>		0.128	0.150		0.0710	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Lead-214</b>	<b>0.551</b>		0.156	0.166		0.0869	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Potassium-40</b>	<b>9.76</b>		1.75	2.01		0.325	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Protactinium-231	0.0000005	U	3.35	3.35		2.76	pCi/g	07/11/18 02:14	08/01/18 07:43	1
	17									
<b>Radium-226</b>	<b>0.531</b>		0.154	0.164	0.700	0.0490	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Radium-228</b>	<b>0.769</b>		0.205	0.219		0.101	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Thallium-208</b>	<b>0.313</b>		0.0869	0.0928		0.0303	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Thorium-228</b>	<b>0.603</b>		0.128	0.150		0.0710	pCi/g	07/11/18 02:14	08/01/18 07:43	1
<b>Thorium-232</b>	<b>0.769</b>		0.205	0.219		0.101	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Thorium-234	-0.0829	U	1.29	1.29		1.06	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Uranium-235	0.175	U	0.383	0.384		0.408	pCi/g	07/11/18 02:14	08/01/18 07:43	1
Uranium-238	-0.0829	U	1.29	1.29		1.06	pCi/g	07/11/18 02:14	08/01/18 07:43	1

**Client Sample ID: PE2-RSYA2-U10-S005**

**Lab Sample ID: 160-29330-5**

**Date Collected: 06/29/18 13:07**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.616</b>		0.364	0.369		0.164	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Actinium-227	0.155	U	0.334	0.335		0.498	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Bismuth-212	0.501	U	0.941	0.942		0.722	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Bismuth-214</b>	<b>0.580</b>		0.147	0.159		0.0376	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Cesium-137	0.0212	U	0.0959	0.0959	0.0700	0.0768	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Cobalt-60	0.0103	U	0.0555	0.0555	0.200	0.0565	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Lead-210</b>	<b>1.01</b>		1.31	1.31		0.860	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Lead-212</b>	<b>0.524</b>		0.111	0.130		0.0514	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Lead-214</b>	<b>0.598</b>		0.126	0.141		0.0724	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Potassium-40</b>	<b>11.2</b>		1.87	2.19		0.324	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Protactinium-231	0.497	U	1.99	1.99		2.18	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Radium-226</b>	<b>0.580</b>		0.147	0.159	0.700	0.0376	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Radium-228</b>	<b>0.616</b>		0.364	0.369		0.164	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Thallium-208</b>	<b>0.226</b>		0.0778	0.0813		0.0258	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Thorium-228</b>	<b>0.524</b>		0.111	0.130		0.0514	pCi/g	07/11/18 02:14	08/01/18 07:45	1
<b>Thorium-232</b>	<b>0.616</b>		0.364	0.369		0.164	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Thorium-234	-0.166	U	1.09	1.09		0.901	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Uranium-235	-0.200	U	0.342	0.343		0.390	pCi/g	07/11/18 02:14	08/01/18 07:45	1
Uranium-238	-0.166	U	1.09	1.09		0.901	pCi/g	07/11/18 02:14	08/01/18 07:45	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S006**

**Lab Sample ID: 160-29330-6**

Date Collected: 06/29/18 13:10

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.876</b>		0.216	0.233		0.0377	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Actinium-227	-0.426	U	1.16	1.16		0.937	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Bismuth-212	0.396	U	0.993	0.994		0.783	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Bismuth-214</b>	<b>0.772</b>		0.195	0.210		0.0741	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Cesium-137	-0.0338	U	0.106	0.106	0.0700	0.0853	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Cobalt-60</b>	<b>0.0400</b>		0.0283	0.0285	0.200	0.0145	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Lead-210</b>	<b>2.08</b>		1.93	1.94		1.23	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Lead-212</b>	<b>0.748</b>		0.131	0.153		0.0588	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Lead-214</b>	<b>0.879</b>		0.168	0.190		0.0822	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Potassium-40</b>	<b>11.9</b>		1.73	2.11		0.146	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Protactinium-231	0.890	U	2.75	2.75		3.01	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Radium-226</b>	<b>0.772</b>		0.195	0.210	0.700	0.0741	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Radium-228</b>	<b>0.876</b>		0.216	0.233		0.0377	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thallium-208</b>	<b>0.367</b>		0.101	0.108		0.0358	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thorium-228</b>	<b>0.748</b>		0.131	0.153		0.0588	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thorium-232</b>	<b>0.876</b>		0.216	0.233		0.0377	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thorium-234</b>	<b>1.38</b>		1.25	1.26		0.939	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Uranium-235	-0.300	U	0.411	0.412		0.678	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Uranium-238</b>	<b>1.38</b>		1.25	1.26		0.939	pCi/g	07/11/18 02:14	08/01/18 08:29	1

**Client Sample ID: PE2-RSYA2-U10-S007**

**Lab Sample ID: 160-29330-7**

Date Collected: 06/29/18 13:13

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.619</b>		0.209	0.219		0.0412	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Actinium-227	0.0869	U	0.491	0.491		0.482	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Bismuth-212	-0.637	U	0.884	0.886		0.885	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Bismuth-214</b>	<b>0.537</b>		0.172	0.181		0.0745	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Cesium-137	0.0248	U	0.0747	0.0748	0.0700	0.0590	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Cobalt-60	-0.0271	U	0.0822	0.0822	0.200	0.0538	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Lead-210</b>	<b>1.24</b>		1.35	1.36		0.919	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Lead-212</b>	<b>0.456</b>		0.132	0.145		0.0819	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Lead-214</b>	<b>0.459</b>		0.126	0.135		0.0470	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Potassium-40</b>	<b>11.6</b>		1.86	2.21		0.312	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Protactinium-231	0.000	U	0.209	0.209		2.63	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Radium-226</b>	<b>0.537</b>		0.172	0.181	0.700	0.0745	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Radium-228</b>	<b>0.619</b>		0.209	0.219		0.0412	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Thallium-208</b>	<b>0.202</b>		0.0734	0.0763		0.0268	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Thorium-228</b>	<b>0.456</b>		0.132	0.145		0.0819	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Thorium-232</b>	<b>0.619</b>		0.209	0.219		0.0412	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Thorium-234	0.639	U	1.27	1.27		1.00	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Uranium-235	-0.0115	U	0.426	0.426		0.351	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Uranium-238	0.639	U	1.27	1.27		1.00	pCi/g	07/11/18 02:14	08/01/18 08:26	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S008**

**Lab Sample ID: 160-29330-8**

Date Collected: 06/29/18 13:16

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.715</b>		0.211	0.223		0.0536	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Actinium-227	-0.346	U	1.08	1.08		0.691	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Bismuth-212	0.000	U	0.357	0.357		0.915	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Bismuth-214</b>	<b>0.656</b>		0.178	0.191		0.0582	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Cesium-137	0.0432	U	0.0813	0.0814	0.0700	0.0615	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Cobalt-60	-0.000421	U	0.120	0.120	0.200	0.0216	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Lead-210	-0.0692	U	2.58	2.58		2.12	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Lead-212</b>	<b>0.798</b>		0.157	0.188		0.0721	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Lead-214</b>	<b>0.777</b>		0.226	0.240		0.107	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Potassium-40</b>	<b>12.4</b>		2.44	2.75		0.630	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Protactinium-231	0.546	U	2.25	2.25		3.55	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Radium-226</b>	<b>0.656</b>		0.178	0.191	0.700	0.0582	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Radium-228</b>	<b>0.715</b>		0.211	0.223		0.0536	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Thallium-208</b>	<b>0.297</b>		0.0948	0.0997		0.0292	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Thorium-228</b>	<b>0.798</b>		0.157	0.188		0.0721	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Thorium-232</b>	<b>0.715</b>		0.211	0.223		0.0536	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Thorium-234	0.438	U	2.17	2.17		1.77	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Uranium-235	0.0678	U	0.150	0.151		0.856	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Uranium-238	0.438	U	2.17	2.17		1.77	pCi/g	07/11/18 02:14	08/01/18 08:27	1

**Client Sample ID: PE2-RSYA2-U10-S009**

**Lab Sample ID: 160-29330-9**

Date Collected: 06/29/18 13:19

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.808</b>		0.171	0.190		0.0852	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Actinium-227	-0.300	U	0.843	0.844		0.571	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Bismuth-212	-0.418	U	1.20	1.20		0.962	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Bismuth-214</b>	<b>0.597</b>		0.143	0.156		0.0480	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Cesium-137	0.0409	U	0.0823	0.0824	0.0700	0.0645	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Cobalt-60	0.00742	U	0.0836	0.0836	0.200	0.0423	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Lead-210	0.927	U	1.61	1.61		1.12	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Lead-212</b>	<b>0.715</b>		0.126	0.156		0.0605	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Lead-214</b>	<b>0.685</b>		0.148	0.164		0.0601	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Potassium-40</b>	<b>11.6</b>		1.67	2.05		0.368	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Protactinium-231	-0.992	U	3.52	3.52		2.87	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Radium-226</b>	<b>0.597</b>		0.143	0.156	0.700	0.0480	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Radium-228</b>	<b>0.808</b>		0.171	0.190		0.0852	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thallium-208</b>	<b>0.258</b>		0.0729	0.0776		0.0259	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thorium-228</b>	<b>0.715</b>		0.126	0.156		0.0605	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thorium-232</b>	<b>0.808</b>		0.171	0.190		0.0852	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Thorium-234</b>	<b>0.911</b>		1.34	1.34		0.901	pCi/g	07/11/18 02:14	08/01/18 08:29	1
Uranium-235	0.0643	U	0.158	0.158		0.355	pCi/g	07/11/18 02:14	08/01/18 08:29	1
<b>Uranium-238</b>	<b>0.911</b>		1.34	1.34		0.901	pCi/g	07/11/18 02:14	08/01/18 08:29	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S010**

**Lab Sample ID: 160-29330-10**

**Date Collected: 06/29/18 13:22**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.995</b>		0.284	0.301		0.114	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Actinium-227	-0.368	U	1.35	1.35		1.10	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Bismuth-212	-0.991	U	1.59	1.60		1.24	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Bismuth-214</b>	<b>0.772</b>		0.219	0.233		0.0757	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Cesium-137	-0.0684	U	0.144	0.145	0.0700	0.114	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Cobalt-60</b>	<b>0.110</b>		0.0612	0.0622	0.200	0.0198	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Lead-210</b>	<b>2.45</b>		2.01	2.03		1.35	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Lead-212</b>	<b>0.763</b>		0.165	0.183		0.0863	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Lead-214</b>	<b>0.978</b>		0.187	0.212		0.0888	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Potassium-40</b>	<b>11.0</b>		2.81	3.03		1.11	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Protactinium-231	1.30	U	3.17	3.18		3.49	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Radium-226</b>	<b>0.772</b>		0.219	0.233	0.700	0.0757	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Radium-228</b>	<b>0.995</b>		0.284	0.301		0.114	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Thallium-208</b>	<b>0.403</b>		0.122	0.129		0.0385	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Thorium-228</b>	<b>0.763</b>		0.165	0.183		0.0863	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Thorium-232</b>	<b>0.995</b>		0.284	0.301		0.114	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Thorium-234</b>	<b>2.74</b>		2.07	2.09		1.18	pCi/g	07/11/18 02:14	08/01/18 08:26	1
Uranium-235	-0.156	U	1.18	1.18		0.745	pCi/g	07/11/18 02:14	08/01/18 08:26	1
<b>Uranium-238</b>	<b>2.74</b>		2.07	2.09		1.18	pCi/g	07/11/18 02:14	08/01/18 08:26	1

**Client Sample ID: PE2-RSYA2-U10-S011**

**Lab Sample ID: 160-29330-11**

**Date Collected: 06/29/18 13:25**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Total Beta Strontium</b>	<b>0.0597</b>		0.0627	0.0629	0.331	0.0468	pCi/g	07/09/18 09:31	07/27/18 11:27	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	94.6		40 - 110					07/09/18 09:31	07/27/18 11:27	1

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.920</b>		0.228	0.247		0.0720	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Actinium-227	0.351	U	0.506	0.507		0.658	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Bismuth-212</b>	<b>1.77</b>		0.609	0.636		0.117	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Bismuth-214</b>	<b>0.455</b>		0.153	0.160		0.0660	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Cesium-137	-0.0643	U	0.0939	0.0941	0.0700	0.0675	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Cobalt-60	-0.0151	U	0.0970	0.0970	0.200	0.0540	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Lead-210	-0.483	U	1.38	1.38		1.43	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Lead-212</b>	<b>0.583</b>		0.114	0.136		0.0552	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Lead-214</b>	<b>0.656</b>		0.133	0.149		0.0569	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Potassium-40</b>	<b>11.7</b>		1.77	2.13		0.276	pCi/g	07/11/18 02:14	08/01/18 08:27	1



# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S011**

**Lab Sample ID: 160-29330-11**

**Date Collected: 06/29/18 13:25**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Protactinium-231	0.0000001	U	3.08	3.08		2.54	pCi/g	07/11/18 02:14	08/01/18 08:27	1
	23									
<b>Radium-226</b>	<b>0.455</b>		0.153	0.160	0.700	0.0660	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Radium-228</b>	<b>0.920</b>		0.228	0.247		0.0720	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Thallium-208</b>	<b>0.283</b>		0.0794	0.0846		0.0246	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Thorium-228</b>	<b>0.583</b>		0.114	0.136		0.0552	pCi/g	07/11/18 02:14	08/01/18 08:27	1
<b>Thorium-232</b>	<b>0.920</b>		0.228	0.247		0.0720	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Thorium-234	-1.85	U	1.90	1.91		1.59	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Uranium-235	0.0616	U	0.151	0.151		0.449	pCi/g	07/11/18 02:14	08/01/18 08:27	1
Uranium-238	-1.85	U	1.90	1.91		1.59	pCi/g	07/11/18 02:14	08/01/18 08:27	1

**Client Sample ID: PE2-RSYA2-U10-S012**

**Lab Sample ID: 160-29330-12**

**Date Collected: 06/29/18 13:28**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.606</b>		0.187	0.197		0.0321	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Actinium-227	0.264	U	0.644	0.644		0.517	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Bismuth-212	0.322	U	0.620	0.621		0.472	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Bismuth-214</b>	<b>0.432</b>		0.117	0.125		0.0258	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Cesium-137</b>	<b>0.176</b>		0.0537	0.0567	0.0700	0.0167	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Cobalt-60	-0.0367	U	0.0869	0.0869	0.200	0.0446	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Lead-210	-0.165	U	1.45	1.45		1.19	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Lead-212</b>	<b>0.371</b>		0.0926	0.104		0.0538	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Lead-214</b>	<b>0.395</b>		0.130	0.136		0.0570	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Potassium-40</b>	<b>9.73</b>		1.53	1.82		0.253	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Protactinium-231	0.000	U	0.579	0.579		2.08	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Radium-226</b>	<b>0.432</b>		0.117	0.125	0.700	0.0258	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Radium-228</b>	<b>0.606</b>		0.187	0.197		0.0321	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Thallium-208</b>	<b>0.139</b>		0.0757	0.0770		0.0371	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Thorium-228</b>	<b>0.371</b>		0.0926	0.104		0.0538	pCi/g	07/11/18 02:14	08/01/18 08:28	1
<b>Thorium-232</b>	<b>0.606</b>		0.187	0.197		0.0321	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Thorium-234	-0.0646	U	1.00	1.00		0.827	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Uranium-235	0.149	U	0.328	0.329		0.285	pCi/g	07/11/18 02:14	08/01/18 08:28	1
Uranium-238	-0.0646	U	1.00	1.00		0.827	pCi/g	07/11/18 02:14	08/01/18 08:28	1

**Client Sample ID: PE2-RSYA2-U10-S013**

**Lab Sample ID: 160-29330-13**

**Date Collected: 06/29/18 13:31**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>6.99</b>		0.755	1.04		0.155	pCi/g	07/11/18 02:14	08/01/18 08:31	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S013**

**Lab Sample ID: 160-29330-13**

**Date Collected: 06/29/18 13:31**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.277	U	0.585	0.585		0.992	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Bismuth-212</b>	<b>7.42</b>		1.72	1.88		0.855	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Bismuth-214</b>	<b>0.779</b>		0.268	0.280		0.115	pCi/g	07/11/18 02:14	08/01/18 08:31	1
Cesium-137	-0.111	U	0.123	0.123	0.0700	0.130	pCi/g	07/11/18 02:14	08/01/18 08:31	1
Cobalt-60	0.0562	U	0.126	0.126	0.200	0.0609	pCi/g	07/11/18 02:14	08/01/18 08:31	1
Lead-210	1.44	U	2.39	2.40		1.58	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Lead-212</b>	<b>7.24</b>		0.377	1.01		0.103	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Lead-214</b>	<b>0.819</b>		0.282	0.295		0.141	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Potassium-40</b>	<b>12.8</b>		2.07	2.45		0.349	pCi/g	07/11/18 02:14	08/01/18 08:31	1
Protactinium-231	-1.80	U	6.27	6.28		5.13	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Radium-226</b>	<b>0.779</b>		0.268	0.280	0.700	0.115	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Radium-228</b>	<b>6.99</b>		0.755	1.04		0.155	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Thallium-208</b>	<b>2.57</b>		0.253	0.367		0.0682	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Thorium-228</b>	<b>7.24</b>		0.377	1.01		0.103	pCi/g	07/11/18 02:14	08/01/18 08:31	1
<b>Thorium-232</b>	<b>6.99</b>		0.755	1.04		0.155	pCi/g	07/11/18 02:14	08/01/18 08:31	1
Thorium-234	-0.334	U	2.28	2.28		1.89	pCi/g	07/11/18 02:14	08/01/18 08:31	1
Uranium-235	0.328	U	0.878	0.878		0.716	pCi/g	07/11/18 02:14	08/01/18 08:31	1
Uranium-238	-0.334	U	2.28	2.28		1.89	pCi/g	07/11/18 02:14	08/01/18 08:31	1

**Client Sample ID: PE2-RSYA2-U10-S014**

**Lab Sample ID: 160-29330-14**

**Date Collected: 06/29/18 13:35**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.624</b>		0.184	0.194		0.0443	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Actinium-227	-0.430	U	0.908	0.910		0.733	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Bismuth-212	0.000	U	0.557	0.557		0.631	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Bismuth-214</b>	<b>0.688</b>		0.152	0.168		0.0528	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Cesium-137	0.0261	U	0.0649	0.0650	0.0700	0.0344	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Cobalt-60	-0.00581	U	0.104	0.104	0.200	0.0429	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Lead-210	0.765	U	1.42	1.42		1.13	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Lead-212</b>	<b>0.775</b>		0.107	0.146		0.0410	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Lead-214</b>	<b>0.748</b>		0.135	0.156		0.0564	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Potassium-40</b>	<b>12.0</b>		1.50	1.94		0.283	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Protactinium-231	0.000	U	0.352	0.352		2.45	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Radium-226</b>	<b>0.688</b>		0.152	0.168	0.700	0.0528	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Radium-228</b>	<b>0.624</b>		0.184	0.194		0.0443	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Thallium-208</b>	<b>0.242</b>		0.0840	0.0877		0.0362	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Thorium-228</b>	<b>0.775</b>		0.107	0.146		0.0410	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Thorium-232</b>	<b>0.624</b>		0.184	0.194		0.0443	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Thorium-234	-0.799	U	1.67	1.68		1.35	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Uranium-235	-0.224	U	0.204	0.205		0.536	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Uranium-238	-0.799	U	1.67	1.68		1.35	pCi/g	07/11/18 02:14	08/01/18 09:06	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S015**

**Lab Sample ID: 160-29330-15**

**Date Collected: 06/29/18 13:39**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>1.15</b>		0.263	0.288		0.0545	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Actinium-227	0.487	U	0.773	0.775		1.07	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Bismuth-212	0.244	U	1.17	1.17		0.938	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Bismuth-214</b>	<b>0.756</b>		0.240	0.252		0.0953	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Cesium-137	0.0553	U	0.0938	0.0940	0.0700	0.0708	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Cobalt-60	-0.00795	U	0.0164	0.0164	0.200	0.0865	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Lead-210	-1.73	U	3.18	3.19		2.69	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Lead-212</b>	<b>0.639</b>		0.165	0.178		0.0903	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Lead-214</b>	<b>0.910</b>		0.195	0.215		0.0582	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Potassium-40</b>	<b>13.7</b>		2.23	2.62		0.211	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Protactinium-231	-0.546	U	4.47	4.47		3.66	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Radium-226</b>	<b>0.756</b>		0.240	0.252	0.700	0.0953	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Radium-228</b>	<b>1.15</b>		0.263	0.288		0.0545	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Thallium-208</b>	<b>0.353</b>		0.0919	0.0986		0.0135	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Thorium-228</b>	<b>0.639</b>		0.165	0.178		0.0903	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Thorium-232</b>	<b>1.15</b>		0.263	0.288		0.0545	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Thorium-234</b>	<b>1.76</b>		1.60	1.62		1.19	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Uranium-235	-0.238	U	0.546	0.546		0.370	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Uranium-238</b>	<b>1.76</b>		1.60	1.62		1.19	pCi/g	07/11/18 02:14	08/01/18 09:08	1

**Client Sample ID: PE2-RSYA2-U10-S016**

**Lab Sample ID: 160-29330-16**

**Date Collected: 06/29/18 13:43**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.900</b>		0.228	0.246		0.0461	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Actinium-227	-0.126	U	0.982	0.982		0.649	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Bismuth-212</b>	<b>1.33</b>		0.712	0.725		0.257	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Bismuth-214</b>	<b>0.691</b>		0.187	0.200		0.0699	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Cesium-137	0.0234	U	0.102	0.102	0.0700	0.0817	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Cobalt-60	-0.0486	U	0.103	0.103	0.200	0.0735	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Lead-210	-0.272	U	2.07	2.07		1.48	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Lead-212</b>	<b>0.826</b>		0.155	0.188		0.0776	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Lead-214</b>	<b>0.719</b>		0.182	0.197		0.0731	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Potassium-40</b>	<b>9.94</b>		1.83	2.09		0.349	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Protactinium-231	0.986	U	2.48	2.48		2.73	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Radium-226</b>	<b>0.691</b>		0.187	0.200	0.700	0.0699	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Radium-228</b>	<b>0.900</b>		0.228	0.246		0.0461	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Thallium-208</b>	<b>0.254</b>		0.0839	0.0880		0.0319	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Thorium-228</b>	<b>0.826</b>		0.155	0.188		0.0776	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Thorium-232</b>	<b>0.900</b>		0.228	0.246		0.0461	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Thorium-234</b>	<b>1.27</b>		1.54	1.54		1.20	pCi/g	07/11/18 02:14	08/01/18 09:06	1
Uranium-235	0.0479	U	0.0918	0.0920		0.402	pCi/g	07/11/18 02:14	08/01/18 09:06	1
<b>Uranium-238</b>	<b>1.27</b>		1.54	1.54		1.20	pCi/g	07/11/18 02:14	08/01/18 09:06	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Client Sample ID: PE2-RSYA2-U10-S017**

**Lab Sample ID: 160-29330-17**

Date Collected: 06/29/18 13:47

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.929</b>		0.260	0.277		0.0424	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Actinium-227	0.0631	U	0.0505	0.0510		0.757	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Bismuth-212	0.432	U	0.824	0.825		0.627	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Bismuth-214</b>	<b>0.641</b>		0.179	0.191		0.0656	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Cesium-137</b>	<b>0.0296</b>		0.0410	0.0411	0.0700	0.0276	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Cobalt-60	0.0267	U	0.0824	0.0824	0.200	0.0398	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Lead-210	0.0291	U	2.03	2.03		1.66	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Lead-212</b>	<b>0.718</b>		0.131	0.161		0.0588	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Lead-214</b>	<b>0.804</b>		0.170	0.189		0.0687	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Potassium-40</b>	<b>12.7</b>		2.06	2.43		0.422	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Protactinium-231	-1.22	U	4.30	4.30		3.51	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Radium-226</b>	<b>0.641</b>		0.179	0.191	0.700	0.0656	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Radium-228</b>	<b>0.929</b>		0.260	0.277		0.0424	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Thallium-208</b>	<b>0.299</b>		0.0842	0.0898		0.0252	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Thorium-228</b>	<b>0.718</b>		0.131	0.161		0.0588	pCi/g	07/11/18 02:14	08/01/18 09:08	1
<b>Thorium-232</b>	<b>0.929</b>		0.260	0.277		0.0424	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Thorium-234	-0.391	U	1.57	1.57		1.76	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Uranium-235	-0.0278	U	0.0341	0.0342		0.622	pCi/g	07/11/18 02:14	08/01/18 09:08	1
Uranium-238	-0.391	U	1.57	1.57		1.76	pCi/g	07/11/18 02:14	08/01/18 09:08	1

**Client Sample ID: PE2-RSYA2-U10-S018**

**Lab Sample ID: 160-29330-18**

Date Collected: 06/29/18 13:52

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.959</b>		0.238	0.257		0.0536	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Actinium-227	-0.403	U	0.892	0.893		0.602	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Bismuth-212	0.0379	U	0.840	0.840		0.689	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Bismuth-214</b>	<b>0.686</b>		0.162	0.177		0.0748	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Cesium-137	0.0275	U	0.0579	0.0580	0.0700	0.0446	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Cobalt-60	-0.0273	U	0.102	0.102	0.200	0.0508	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Lead-210</b>	<b>1.12</b>		1.57	1.58		1.06	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Lead-212</b>	<b>0.786</b>		0.128	0.163		0.0581	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Lead-214</b>	<b>0.744</b>		0.163	0.180		0.0641	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Potassium-40</b>	<b>11.1</b>		1.71	2.05		0.448	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Protactinium-231	-0.864	U	3.27	3.28		2.67	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Radium-226</b>	<b>0.686</b>		0.162	0.177	0.700	0.0748	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Radium-228</b>	<b>0.959</b>		0.238	0.257		0.0536	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Thallium-208</b>	<b>0.283</b>		0.0740	0.0796		0.0264	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Thorium-228</b>	<b>0.786</b>		0.128	0.163		0.0581	pCi/g	07/11/18 02:14	08/01/18 09:09	1
<b>Thorium-232</b>	<b>0.959</b>		0.238	0.257		0.0536	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Thorium-234	0.669	U	0.648	0.652		0.863	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Uranium-235	0.156	U	0.361	0.361		0.293	pCi/g	07/11/18 02:14	08/01/18 09:09	1
Uranium-238	0.669	U	0.648	0.652		0.863	pCi/g	07/11/18 02:14	08/01/18 09:09	1

# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

## Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-374451/13-A

Matrix: Solid

Analysis Batch: 378547

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 374451

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.01197	U	0.0505	0.0505	0.331	0.0428	pCi/g	07/09/18 09:31	07/27/18 11:28	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Sr Carrier	91.3		40 - 110	07/09/18 09:31	07/27/18 11:28	1

Lab Sample ID: LCS 160-374451/1-A

Matrix: Solid

Analysis Batch: 378547

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 374451

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	8.22	8.535		0.680	0.331	0.0443	pCi/g	104	75 - 125

Carrier	LCS %Yield	LCS Qualifier	Limits
Sr Carrier	92.7		40 - 110

Lab Sample ID: 160-29330-1 DU

Matrix: Solid

Analysis Batch: 378547

Client Sample ID: PE2-RSYA2-U10-S001

Prep Type: Total/NA

Prep Batch: 374451

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Total Beta Strontium	0.0183	U	-0.00659	U	0.0562	0.331	0.0468	pCi/g	0.21	1

Carrier	DU %Yield	DU Qualifier	Limits
Sr Carrier	92.6		40 - 110

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-374823/1-A

Matrix: Solid

Analysis Batch: 379554

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 374823

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.01879	U	0.0461	0.0461		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Actinium-227	0.1501	U	0.298	0.299		0.284	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Bismuth-212	0.2520	U	0.723	0.723		0.561	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Bismuth-214	-0.01018	U	0.0142	0.0142		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Cesium-137	0.0000	U	0.00922	0.00922	0.0700	0.0232	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Cobalt-60	-0.001443	U	0.0812	0.0812	0.200	0.0162	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Lead-210	0.03866	U	1.24	1.24		0.896	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Lead-212	-0.002459	U	0.0791	0.0791		0.0650	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Lead-214	0.0000736	U	0.106	0.106		0.0868	pCi/g	07/11/18 02:14	08/01/18 07:40	1

# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-374823/1-A

Matrix: Solid

Analysis Batch: 379554

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 374823

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Potassium-40	-0.2980	U	0.910	0.910		0.498	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Protactinium-231	0.0000	U	0.294	0.294		1.91	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Radium-226	-0.01018	U	0.0142	0.0142	0.700	0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Radium-228	0.01879	U	0.0461	0.0461		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thallium-208	0.04770		0.0620	0.0622		0.0266	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thorium-228	-0.002459	U	0.0791	0.0791		0.0650	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thorium-232	0.01879	U	0.0461	0.0461		0.125	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Thorium-234	-0.2907	U	0.996	0.997		0.833	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Uranium-235	0.05080	U	0.263	0.263		0.212	pCi/g	07/11/18 02:14	08/01/18 07:40	1
Uranium-238	-0.2907	U	0.996	0.997		0.833	pCi/g	07/11/18 02:14	08/01/18 07:40	1

Lab Sample ID: LCS 160-374823/2-A

Matrix: Solid

Analysis Batch: 379556

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 374823

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	92.69		9.76		0.593	pCi/g	96	87 - 116
Cesium-137	28.2	27.42		2.95	0.0700	0.122	pCi/g	97	87 - 120
Cobalt-60	12.9	12.33		1.31	0.200	0.0562	pCi/g	95	87 - 115

Lab Sample ID: 160-29330-1 DU

Matrix: Solid

Analysis Batch: 379559

Client Sample ID: PE2-RSYA2-U10-S001

Prep Type: Total/NA

Prep Batch: 374823

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.857		0.8545		0.241		0.206	pCi/g	0.01	1
Actinium-227	-0.422	U	0.03550	U	0.349		0.825	pCi/g	0.29	1
Bismuth-212	0.446	U	-0.4084	U	1.05		0.831	pCi/g	0.42	1
Bismuth-214	0.708		0.7802		0.207		0.0712	pCi/g	0.16	1
Cesium-137	-0.00379	U	0.03857	U	0.0730	0.0700	0.0561	pCi/g	0.16	1
Cobalt-60	0.0783		0.06123		0.0412	0.200	0.0147	pCi/g	0.19	1
Lead-210	-0.982	U	0.9160	U	1.77		1.40	pCi/g	0.44	1
Lead-212	0.873		0.9500		0.184		0.0469	pCi/g	0.20	1
Lead-214	0.762		0.8772		0.212		0.0656	pCi/g	0.28	1
Potassium-40	12.4		12.48		2.25		0.404	pCi/g	0.02	1
Protactinium-231	-0.00000	U	-0.3861	U	3.73		3.06	pCi/g	0.05	1
Radium-226	0.708		0.7802		0.207	0.700	0.0712	pCi/g	0.16	1
Radium-228	0.857		0.8545		0.241		0.206	pCi/g	0.01	1
Thallium-208	0.353		0.3468		0.0883		0.0229	pCi/g	0.03	1
Thorium-228	0.873		0.9500		0.184		0.0469	pCi/g	0.20	1
Thorium-232	0.857		0.8545		0.241		0.206	pCi/g	0.01	1
Thorium-234	1.56		-0.8695	U	1.94		1.56	pCi/g	0.60	1
Uranium-235	-0.335	U	0.3893		0.262		0.126	pCi/g	0.99	1
Uranium-238	1.56		-0.8695	U	1.94		1.56	pCi/g	0.60	1



## QC Association Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

## Rad

## Leach Batch: 374109

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29330-1	PE2-RSYA2-U10-S001	Total/NA	Solid	Dry and Grind	
160-29330-2	PE2-RSYA2-U10-S002	Total/NA	Solid	Dry and Grind	
160-29330-3	PE2-RSYA2-U10-S003	Total/NA	Solid	Dry and Grind	
160-29330-4	PE2-RSYA2-U10-S004	Total/NA	Solid	Dry and Grind	
160-29330-5	PE2-RSYA2-U10-S005	Total/NA	Solid	Dry and Grind	
160-29330-6	PE2-RSYA2-U10-S006	Total/NA	Solid	Dry and Grind	
160-29330-7	PE2-RSYA2-U10-S007	Total/NA	Solid	Dry and Grind	
160-29330-8	PE2-RSYA2-U10-S008	Total/NA	Solid	Dry and Grind	
160-29330-9	PE2-RSYA2-U10-S009	Total/NA	Solid	Dry and Grind	
160-29330-10	PE2-RSYA2-U10-S010	Total/NA	Solid	Dry and Grind	
160-29330-11	PE2-RSYA2-U10-S011	Total/NA	Solid	Dry and Grind	
160-29330-12	PE2-RSYA2-U10-S012	Total/NA	Solid	Dry and Grind	
160-29330-13	PE2-RSYA2-U10-S013	Total/NA	Solid	Dry and Grind	
160-29330-14	PE2-RSYA2-U10-S014	Total/NA	Solid	Dry and Grind	
160-29330-15	PE2-RSYA2-U10-S015	Total/NA	Solid	Dry and Grind	
160-29330-16	PE2-RSYA2-U10-S016	Total/NA	Solid	Dry and Grind	
160-29330-17	PE2-RSYA2-U10-S017	Total/NA	Solid	Dry and Grind	
160-29330-18	PE2-RSYA2-U10-S018	Total/NA	Solid	Dry and Grind	
160-29330-1 DU	PE2-RSYA2-U10-S001	Total/NA	Solid	Dry and Grind	

## Prep Batch: 374451

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29330-1	PE2-RSYA2-U10-S001	Total/NA	Solid	DPS-0	374109
160-29330-11	PE2-RSYA2-U10-S011	Total/NA	Solid	DPS-0	374109
MB 160-374451/13-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-374451/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	
160-29330-1 DU	PE2-RSYA2-U10-S001	Total/NA	Solid	DPS-0	374109

## Prep Batch: 374823

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29330-1	PE2-RSYA2-U10-S001	Total/NA	Solid	Fill_Geo-21	374109
160-29330-2	PE2-RSYA2-U10-S002	Total/NA	Solid	Fill_Geo-21	374109
160-29330-3	PE2-RSYA2-U10-S003	Total/NA	Solid	Fill_Geo-21	374109
160-29330-4	PE2-RSYA2-U10-S004	Total/NA	Solid	Fill_Geo-21	374109
160-29330-5	PE2-RSYA2-U10-S005	Total/NA	Solid	Fill_Geo-21	374109
160-29330-6	PE2-RSYA2-U10-S006	Total/NA	Solid	Fill_Geo-21	374109
160-29330-7	PE2-RSYA2-U10-S007	Total/NA	Solid	Fill_Geo-21	374109
160-29330-8	PE2-RSYA2-U10-S008	Total/NA	Solid	Fill_Geo-21	374109
160-29330-9	PE2-RSYA2-U10-S009	Total/NA	Solid	Fill_Geo-21	374109
160-29330-10	PE2-RSYA2-U10-S010	Total/NA	Solid	Fill_Geo-21	374109
160-29330-11	PE2-RSYA2-U10-S011	Total/NA	Solid	Fill_Geo-21	374109
160-29330-12	PE2-RSYA2-U10-S012	Total/NA	Solid	Fill_Geo-21	374109
160-29330-13	PE2-RSYA2-U10-S013	Total/NA	Solid	Fill_Geo-21	374109
160-29330-14	PE2-RSYA2-U10-S014	Total/NA	Solid	Fill_Geo-21	374109
160-29330-15	PE2-RSYA2-U10-S015	Total/NA	Solid	Fill_Geo-21	374109
160-29330-16	PE2-RSYA2-U10-S016	Total/NA	Solid	Fill_Geo-21	374109
160-29330-17	PE2-RSYA2-U10-S017	Total/NA	Solid	Fill_Geo-21	374109
160-29330-18	PE2-RSYA2-U10-S018	Total/NA	Solid	Fill_Geo-21	374109
MB 160-374823/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-374823/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29330-1 DU	PE2-RSYA2-U10-S001	Total/NA	Solid	Fill_Geo-21	374109

## Tracer/Carrier Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-2

**Method: 905.0 - Total Beta Strontium (GFPC)**

**Matrix: Solid**

**Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)						
		Sr Carrier						
Lab Sample ID	Client Sample ID	(40-110)						
160-29330-1	PE2-RSYA2-U10-S001	92.6						
160-29330-1 DU	PE2-RSYA2-U10-S001	92.6						
160-29330-11	PE2-RSYA2-U10-S011	94.6						
LCS 160-374451/1-A	Lab Control Sample	92.7						
MB 160-374451/13-A	Method Blank	91.3						

### Tracer/Carrier Legend

Sr Carrier = Sr Carrier

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-29330-3

TestAmerica Sample Delivery Group: Recount Request  
Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Eddie Kalombo

*Rhonda Ridenhower*

---

Authorized for release by:  
8/9/2018 9:22:03 PM

Rhonda Ridenhower, Manager of Project Management  
(314)298-8566  
[rhonda.ridenhower@testamericainc.com](mailto:rhonda.ridenhower@testamericainc.com)

### LINKS

Review your project  
results through

TotalAccess

Have a Question?



Visit us at:

[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	5
Receipt Checklists . . . . .	7
Definitions/Glossary . . . . .	8
Method Summary . . . . .	9
Sample Summary . . . . .	10
Client Sample Results . . . . .	11
QC Association Summary . . . . .	12

1

2

3

4

5

6

7

8

9

10

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-3  
SDG: Recount Request

**Job ID: 160-29330-3**

**Laboratory: TestAmerica St. Louis**

### Narrative

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: Hunters Point Naval Shipyard - Parcel E2**

**Report Number: 160-29330-3**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-3  
SDG: Recount Request

---

### Job ID: 160-29330-3 (Continued)

---

#### Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

#### RECEIPT

The samples were received on 07/05/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample PE2-RSYA2-U10-S012 (160-29330-12) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 07/05/2018, prepared on 07/11/2018 and analyzed on 08/06/2018. A recount was requested by the client.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

1

2

3

4

5

6

7

8

9

10





APTIM Federal Services, LLC  
4005 Port Chicago Hwy  
Concord, CA 94520

## CHAIN OF CUSTODY

Ref. Document # PE2 RSYA2 USE10\_FW\_PBOVerEx#547

Page 1 of 2

Project Manager: **Nels Johnson**  
(Name & phone #)

Project Number: 500506

CTO-013 RSYA2 USE 10 Freshwater  
Wetlands and Panhandle Lead Over-  
excavation Systematic

Project Name: HPNS - Parcel E-2

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.2.18

Waybill Number:

Lab Destination: TestAmerica (St. Louis Lab)

Lab Address: 13715 Rider Trail North

Earth City, MO 63045


Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Send Report To: **Eddie Kalombo**  
Phone/Fax Number: 415-987-0760  
Address: 4005 Port Chicago Hwy  
City: Concord, CA 94520

Sampler's Name(s): **Edwin Ramirez**

Sample ID Number	Sample Description	Date	Time	Method	Matrix	# of containers	Container Type						
PE2-RSYA2-U10-S001	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1258	G	SO	1	16 oz. plastic jar	X				X	5
PE2-RSYA2-U10-S002	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1259	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S003	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1303	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S004	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1304	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S005	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1307	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S006	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1310	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S007	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1313	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S008	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1316	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S009	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1319	G	SO	1	16 oz. plastic jar	X					5
PE2-RSYA2-U10-S010	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1322	G	SO	1	16 oz. plastic jar	X					5

29330 Chain of Custody





### Special Instructions:

7 days ingrown draft and follow with 21 days final.

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above 0.331 pCi/g.

<input type="checkbox"/> 24-hr		<input type="checkbox"/> 10-day		<input checked="" type="checkbox"/> 3-day	
Standard TAT - 10-day		Level Of QC Required:		Project Specific:	
Relinquished By: <b>Edwin Ramirez</b>	Date: 6/29/18 Time: 1100	I	II	III	Date: 6.29.18 Time: 1100
Relinquished By: <b>Edwin Ramirez</b>	Date: 7.2.18 Time: 1600	Received By: <b>Edwin Ramirez</b>		Date: 7.2.18 Time: 0940	
Relinquished By: <b>Edwin Ramirez</b>	Date: Time:	Received By: <b>Edwin Ramirez</b>		Date: Time:	
Relinquished By: <b>Edwin Ramirez</b>	Date: Time:	Received By: <b>Edwin Ramirez</b>		Date: Time:	
Method Codes C = Composite G = Grab		Matrix Codes DW = Drinking Water GW = Ground Water WW = Waste Water A = Air		SO = Soil SL = Sludge CP = Chip Samples ABS = Asbestos, PO = Pipe Opening	



## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29330-3

SDG Number: Recount Request

**Login Number: 29330****List Number: 1****Creator: Press, Nicholas B****List Source: TestAmerica St. Louis**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-3  
SDG: Recount Request

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Method Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-3  
SDG: Recount Request

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

**Protocol References:**

- DOE = U.S. Department of Energy
- None = None

**Laboratory References:**

- TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

1
2
3
4
5
6
7
8
9
10

# Sample Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-3  
SDG: Recount Request

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29330-12	PE2-RSYA2-U10-S012	Solid	06/29/18 13:28	07/05/18 08:40

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10



# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-3  
SDG: Recount Request

**Client Sample ID: PE2-RSYA2-U10-S012**

**Lab Sample ID: 160-29330-12**

**Date Collected: 06/29/18 13:28**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.665</b>		0.175	0.187		0.0519	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Actinium-227	-0.340	U	0.755	0.756		0.507	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Bismuth-212	0.0441	U	0.813	0.813		0.666	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Bismuth-214</b>	<b>0.383</b>		0.142	0.148		0.0619	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Cesium-137</b>	<b>0.158</b>		0.0488	0.0515	0.0700	0.00849	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Cobalt-60	-0.0106	U	0.0972	0.0972	0.200	0.0492	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Lead-210	0.721	U	1.57	1.57		1.06	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Lead-212</b>	<b>0.462</b>		0.103	0.119		0.0526	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Lead-214</b>	<b>0.348</b>		0.109	0.115		0.0556	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Potassium-40</b>	<b>10.2</b>		1.54	1.86		0.349	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Protactinium-231	0.000	U	0.388	0.388		2.12	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Radium-226</b>	<b>0.383</b>		0.142	0.148	0.700	0.0619	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Radium-228</b>	<b>0.665</b>		0.175	0.187		0.0519	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Thallium-208</b>	<b>0.251</b>		0.0699	0.0746		0.0246	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Thorium-228</b>	<b>0.462</b>		0.103	0.119		0.0526	pCi/g	07/11/18 02:14	08/06/18 13:05	1
<b>Thorium-232</b>	<b>0.665</b>		0.175	0.187		0.0519	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Thorium-234	0.453	U	0.623	0.624		0.829	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Uranium-235	-0.218	U	0.312	0.313		0.338	pCi/g	07/11/18 02:14	08/06/18 13:05	1
Uranium-238	0.453	U	0.623	0.624		0.829	pCi/g	07/11/18 02:14	08/06/18 13:05	1

# QC Association Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-3  
SDG: Recount Request

Rad

Leach Batch: 380203

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29330-12	PE2-RSYA2-U10-S012	Total/NA	Solid	Dry and Grind	

Prep Batch: 380658

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29330-12	PE2-RSYA2-U10-S012	Total/NA	Solid	Fill_Geo-21	380203

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

TestAmerica Job ID: 160-29330-4

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Eddie Kalombo

*Rhonda Ridenhower*

Authorized for release by:

8/24/2018 3:30:50 PM

Rhonda Ridenhower, Manager of Project Management  
(314)298-8566

[rhonda.ridenhower@testamericainc.com](mailto:rhonda.ridenhower@testamericainc.com)

### LINKS

Review your project  
results through

TotalAccess

Have a Question?



Visit us at:

[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	5
Receipt Checklists . . . . .	7
Definitions/Glossary . . . . .	8
Method Summary . . . . .	9
Sample Summary . . . . .	10
Client Sample Results . . . . .	11
QC Sample Results . . . . .	20
QC Association Summary . . . . .	22

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Job ID: 160-29330-4**

**Laboratory: TestAmerica St. Louis**

### Narrative

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: Hunters Point Naval Shipyard - Parcel E2**

**Report Number: 160-29330-4**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup  
Method 3650B: Acid-Base Partition Cleanup  
Method 3660B: Sulfur Cleanup

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

### Job ID: 160-29330-4 (Continued)

#### Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

#### RECEIPT

The samples were received on 07/05/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C. A recount was requested by the client for all samples on the COC for job 160-29330-4.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYA2-U10-S001 (160-29330-1), PE2-RSYA2-U10-S002 (160-29330-2), PE2-RSYA2-U10-S003 (160-29330-3), PE2-RSYA2-U10-S004 (160-29330-4), PE2-RSYA2-U10-S005 (160-29330-5), PE2-RSYA2-U10-S006 (160-29330-6), PE2-RSYA2-U10-S007 (160-29330-7), PE2-RSYA2-U10-S008 (160-29330-8), PE2-RSYA2-U10-S009 (160-29330-9), PE2-RSYA2-U10-S010 (160-29330-10), PE2-RSYA2-U10-S011 (160-29330-11), PE2-RSYA2-U10-S012 (160-29330-12), PE2-RSYA2-U10-S013 (160-29330-13), PE2-RSYA2-U10-S014 (160-29330-14), PE2-RSYA2-U10-S015 (160-29330-15), PE2-RSYA2-U10-S016 (160-29330-16), PE2-RSYA2-U10-S017 (160-29330-17) and PE2-RSYA2-U10-S018 (160-29330-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 08/16/2018, prepared on 08/16/2018 and analyzed on 08/16/2018 and 08/21/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

PE2-RSYA2-U10-S002 (160-29330-2), PE2-RSYA2-U10-S003 (160-29330-3), PE2-RSYA2-U10-S004 (160-29330-4), PE2-RSYA2-U10-S010 (160-29330-10), PE2-RSYA2-U10-S013 (160-29330-13), PE2-RSYA2-U10-S016 (160-29330-16) and (160-29330-A-1-J DU)

Sample PE2-RSYA2-U10-S013 (160-29330-13); the cesium-137 detection goal was not met, this appears to be also in part to higher activity in Pb-212/Th-228, Ac-228/Ra-228/Th-232.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.





APTIM Federal Services, LLC  
4005 Port Chicago Hwy  
Concord, CA 94520

## CHAIN OF CUSTODY

Ref. Document # PE2-RSYA2-USE10-FW\_PBOVerEx#547

Page 1 of 2

Project Manager: **Nels Johnson**  
(Name & phone #)

Project Number: 500506

CTO-013 RSYA2 USE 10 Freshwater  
Wetlands and Panhandle Lead Over-  
excavation Systematic

Project Name: HPNS - Parcel E-2

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.2.18

Waybill Number:

Lab Destination: TestAmerica (St. Louis Lab)

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Earth City, MO 63045

Send Report To: **Eddie Kalombo**  
Phone/Fax Number: 415-987-0760  
Address: 4005 Port Chicago Hwy  
City: Concord, CA 94520

Sampler's Name(s): **Edwin Ramirez**

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Preservative (water)			Gamma Spec (EPA 191.1 M) 7 day in-growth preliminary results and full 21 day in-growth for full gamma results	Analyses Requested			Dose Rate µR/hr
		Date	Time	Method			Preservative (soil)	Container Type			Total Strontium (EPA 905 MOD)	Strontium 90 (EPA 905 MOD)		
PE2-RSYA2-U10-S001	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1258	G	SO	1	16 oz. plastic jar			X	X	X		5
PE2-RSYA2-U10-S002	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1259	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S003	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1303	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S004	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1304	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S005	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1307	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S006	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1310	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S007	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1313	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S008	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1316	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S009	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1319	G	SO	1	16 oz. plastic jar			X				5
PE2-RSYA2-U10-S010	Parcel E-2 RSYA2 USE 10 Systematic	6/29/18	1322	G	SO	1	16 oz. plastic jar			X				5



Special Instructions:

7 days ingrown draft and follow with 21 days final.

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above 0.331 pCi/g.

<input type="checkbox"/> 24-hr		<input type="checkbox"/> 10-day		<input type="checkbox"/> 3-day	
Standard TAT - 10-day		Level Of QC Required:		Project Specific:	
Relinquished By: <b>Edwin Ramirez</b>	Date: 6/29/18 Time: 1100	I	II	III	Received By: <b>Edwin Ramirez</b> Date: 6.29.18 Time: 1100
Relinquished By: <b>Edwin Ramirez</b>	Date: 7.2.18 Time: 1600				Received By: <b>Edwin Ramirez</b> Date: 7.2.18 Time: 0940
Relinquished By:	Date:				Received By:
Relinquished By:	Date:				Received By:
Relinquished By:	Date:				Received By:
		Method Codes		Matrix Codes	
		C = Composite		SO = Soil	
		G = Grab		SL = Sludge	
				CP = Chip Samples	
				ABS = Asbestos, PO = Pipe Opening	



APTIM Federal Services, LLC  
4005 Port Chicago Hwy  
Concord, CA 94520

## CHAIN OF CUSTODY

Ref. Document # PE2\_RSYA2\_USE10\_FW\_PBOVerEx#547

Page 2 of 2

Project Number: 500506

CTO-013 RSYA2 USE 10 Freshwater  
Wetlands and Panhandle Lead Over-  
excavation Systematic

Project Name: HPNS - Parcel E-2

Project Location: HPNS - Parcel E-2

Purchase Order #: 202296

Shipment/Pickup Date: 7.2.18

Waybill Number:

Lab Destination: TestAmerica (St. Louis Lab)

Lab Contact Name / ph. #: Rhonda Ridenhower (314) 298-8566

Earth City, MO 63045

Project Manager: Nels Johnson

(Name & phone #)

Send Report To: Eddie Kalombo

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

City: Concord, CA, 94520

Sampler's Name(s): JOHNSON, NELS

Sample Description

Sample ID Number	Sample Description
PE2-RSYA2-U10-S011	Parcel E-2 RSYA2 USE 10 Systematic
PE2-RSYA2-U10-S012	Parcel E-2 RSYA2 USE 10 Systematic
PE2-RSYA2-U10-S013	Parcel E-2 RSYA2 USE 10 Systematic
PE2-RSYA2-U10-S014	Parcel E-2 RSYA2 USE 10 Systematic
PE2-RSYA2-U10-S015	Parcel E-2 RSYA2 USE 10 Systematic
PE2-RSYA2-U10-S016	Parcel E-2 RSYA2 USE 10 Systematic
PE2-RSYA2-U10-S017	Parcel E-2 RSYA2 USE 10 Systematic
PE2-RSYA2-U10-S018	Parcel E-2 RSYA2 USE 10 Systematic

### Collection Information

Date	Time	Method	Matrix	# of containers	Preservative (water)
6/29/18	1325	G	SO	1	16 oz. plastic jar
6/29/18	1328	G	SO	1	16 oz. plastic jar
6/29/18	1331	G	SO	1	16 oz. plastic jar
6/29/18	1335	G	SO	1	16 oz. plastic jar
6/29/18	1339	G	SO	1	16 oz. plastic jar
6/29/18	1343	G	SO	1	16 oz. plastic jar
6/29/18	1347	G	SO	1	16 oz. plastic jar
6/29/18	1352	G	SO	1	16 oz. plastic jar

### Special Instructions:

7 days ingrowth draft and follow with 21 days final.

Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g.

<input type="checkbox"/> 24-hr		<input checked="" type="checkbox"/> 3-day		<input type="checkbox"/> 10-day	
Standard TAT - 10-day		Project Specific:		III	
Relinquished By: JOHNSON, NELS	Date: 6/29/18	Received By: EDDIE KALOMBO	Date: 6.24.18	Time: 1100	
Relinquished By: EDDIE KALOMBO	Date: 7.2.18	Received By: Nicholas Kern	Date: 7.5.18	Time: 0840	
Relinquished By:	Date:	Received By:	Date:	Time:	
Relinquished By:	Date:	Received By:	Date:	Time:	
Method Codes				C = Composite	
Matrix Codes				G = Grab	
DW = Drinking Water				SO = Soil	
GW = Ground Water				SL = Sludge	
WW = Waste Water				CP = Chip Samples	
A = Air				ABS=Asbestos, PO=Pipe Opening	

## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29330-4

**Login Number: 29330****List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Method Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

Method	Method Description	Protocol	Laboratory
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

- Protocol References:**
- DOE = U.S. Department of Energy
  - None = None
- Laboratory References:**
- TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

1
2
3
4
5
6
7
8
9
10
11



## Sample Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29330-1	PE2-RSYA2-U10-S001	Solid	06/29/18 12:58	07/05/18 08:40
160-29330-2	PE2-RSYA2-U10-S002	Solid	06/29/18 12:59	07/05/18 08:40
160-29330-3	PE2-RSYA2-U10-S003	Solid	06/29/18 13:03	07/05/18 08:40
160-29330-4	PE2-RSYA2-U10-S004	Solid	06/29/18 13:04	07/05/18 08:40
160-29330-5	PE2-RSYA2-U10-S005	Solid	06/29/18 13:07	07/05/18 08:40
160-29330-6	PE2-RSYA2-U10-S006	Solid	06/29/18 13:10	07/05/18 08:40
160-29330-7	PE2-RSYA2-U10-S007	Solid	06/29/18 13:13	07/05/18 08:40
160-29330-8	PE2-RSYA2-U10-S008	Solid	06/29/18 13:16	07/05/18 08:40
160-29330-9	PE2-RSYA2-U10-S009	Solid	06/29/18 13:19	07/05/18 08:40
160-29330-10	PE2-RSYA2-U10-S010	Solid	06/29/18 13:22	07/05/18 08:40
160-29330-11	PE2-RSYA2-U10-S011	Solid	06/29/18 13:25	07/05/18 08:40
160-29330-12	PE2-RSYA2-U10-S012	Solid	06/29/18 13:28	07/05/18 08:40
160-29330-13	PE2-RSYA2-U10-S013	Solid	06/29/18 13:31	07/05/18 08:40
160-29330-14	PE2-RSYA2-U10-S014	Solid	06/29/18 13:35	07/05/18 08:40
160-29330-15	PE2-RSYA2-U10-S015	Solid	06/29/18 13:39	07/05/18 08:40
160-29330-16	PE2-RSYA2-U10-S016	Solid	06/29/18 13:43	07/05/18 08:40
160-29330-17	PE2-RSYA2-U10-S017	Solid	06/29/18 13:47	07/05/18 08:40
160-29330-18	PE2-RSYA2-U10-S018	Solid	06/29/18 13:52	07/05/18 08:40



# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S001**

**Date Collected: 06/29/18 12:58**

**Date Received: 07/05/18 08:40**

**Lab Sample ID: 160-29330-1**

**Matrix: Solid**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.994</b>		0.292	0.309		0.114	pCi/g	08/16/18 10:10	08/16/18 11:11	1
Actinium-227	0.378	U	0.895	0.896		0.600	pCi/g	08/16/18 10:10	08/16/18 11:11	1
Bismuth-212	0.473	U	1.13	1.13		0.876	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Bismuth-214</b>	<b>0.540</b>		0.265	0.271		0.123	pCi/g	08/16/18 10:10	08/16/18 11:11	1
Cesium-137	0.0383	U	0.0822	0.0823	0.0700	0.0629	pCi/g	08/16/18 10:10	08/16/18 11:11	1
Cobalt-60	0.0328	U	0.0999	0.100	0.200	0.0481	pCi/g	08/16/18 10:10	08/16/18 11:11	1
Lead-210	1.10	U	2.06	2.07		1.42	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Lead-212</b>	<b>0.693</b>		0.173	0.195		0.102	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Lead-214</b>	<b>0.782</b>		0.195	0.211		0.0862	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Potassium-40</b>	<b>11.6</b>		2.11	2.42		0.407	pCi/g	08/16/18 10:10	08/16/18 11:11	1
Protactinium-231	0.000	U	1.64	1.64		3.20	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Radium-226</b>	<b>0.540</b>		0.265	0.271	0.700	0.123	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Radium-228</b>	<b>0.994</b>		0.292	0.309		0.114	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Thallium-208</b>	<b>0.398</b>		0.112	0.119		0.0410	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Thorium-228</b>	<b>0.693</b>		0.173	0.195		0.102	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Thorium-232</b>	<b>0.994</b>		0.292	0.309		0.114	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Thorium-234</b>	<b>2.53</b>		2.02	2.04		1.20	pCi/g	08/16/18 10:10	08/16/18 11:11	1
Uranium-235	0.125	U	0.381	0.382		0.372	pCi/g	08/16/18 10:10	08/16/18 11:11	1
<b>Uranium-238</b>	<b>2.53</b>		2.02	2.04		1.20	pCi/g	08/16/18 10:10	08/16/18 11:11	1

**Client Sample ID: PE2-RSYA2-U10-S002**

**Date Collected: 06/29/18 12:59**

**Date Received: 07/05/18 08:40**

**Lab Sample ID: 160-29330-2**

**Matrix: Solid**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.682</b>		0.323	0.330		0.126	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Actinium-227	-0.593	U	1.46	1.46		1.18	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Bismuth-212	0.637	U	1.35	1.35		1.05	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Bismuth-214</b>	<b>0.568</b>		0.199	0.208		0.0893	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Cesium-137	-0.0621	U	0.124	0.125	0.0700	0.0942	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Cobalt-60	-0.0761	U	0.151	0.151	0.200	0.0933	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Lead-210</b>	<b>1.69</b>		2.01	2.01		1.25	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Lead-212</b>	<b>0.762</b>		0.165	0.193		0.0838	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Lead-214</b>	<b>0.725</b>		0.172	0.188		0.0849	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Potassium-40</b>	<b>12.9</b>		2.34	2.69		0.456	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Protactinium-231	-1.46	U	4.64	4.65		3.77	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Radium-226</b>	<b>0.568</b>		0.199	0.208	0.700	0.0893	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Radium-228</b>	<b>0.682</b>		0.323	0.330		0.126	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Thallium-208</b>	<b>0.282</b>		0.134	0.137		0.0654	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Thorium-228</b>	<b>0.762</b>		0.165	0.193		0.0838	pCi/g	08/16/18 10:10	08/16/18 11:12	1
<b>Thorium-232</b>	<b>0.682</b>		0.323	0.330		0.126	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Thorium-234	0.175	U	2.41	2.41		1.97	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Uranium-235	-0.0317	U	0.717	0.717		0.642	pCi/g	08/16/18 10:10	08/16/18 11:12	1
Uranium-238	0.175	U	2.41	2.41		1.97	pCi/g	08/16/18 10:10	08/16/18 11:12	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S003**

**Lab Sample ID: 160-29330-3**

Date Collected: 06/29/18 13:03

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	1.03		0.215	0.240		0.0683	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Actinium-227	1.10		0.776	0.785		0.482	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Bismuth-212	0.314	U	0.885	0.886		0.700	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Bismuth-214	0.526		0.187	0.195		0.0882	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Cesium-137	-0.0537	U	0.0931	0.0933	0.0700	0.0727	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Cobalt-60	0.0207	U	0.0667	0.0667	0.200	0.0325	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Lead-210	0.311	U	1.86	1.86		1.32	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Lead-212	0.645		0.123	0.149		0.0583	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Lead-214	0.428		0.166	0.172		0.0811	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Potassium-40	11.6		1.73	2.10		0.373	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Protactinium-231	0.000	U	0.478	0.478		2.66	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Radium-226	0.526		0.187	0.195	0.700	0.0882	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Radium-228	1.03		0.215	0.240		0.0683	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Thallium-208	0.240		0.0843	0.0879		0.0337	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Thorium-228	0.645		0.123	0.149		0.0583	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Thorium-232	1.03		0.215	0.240		0.0683	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Thorium-234	0.445	U	0.693	0.694		0.997	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Uranium-235	-0.279	U	0.404	0.405		0.448	pCi/g	08/16/18 10:10	08/16/18 11:13	1
Uranium-238	0.445	U	0.693	0.694		0.997	pCi/g	08/16/18 10:10	08/16/18 11:13	1

**Client Sample ID: PE2-RSYA2-U10-S004**

**Lab Sample ID: 160-29330-4**

Date Collected: 06/29/18 13:04

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.658		0.366	0.372		0.153	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Actinium-227	0.454	U	0.722	0.723		0.945	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Bismuth-212	-0.479	U	1.43	1.43		1.02	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Bismuth-214	0.657		0.188	0.200		0.0631	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Cesium-137	-0.0641	U	0.117	0.117	0.0700	0.0838	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Cobalt-60	0.0611		0.0494	0.0498	0.200	0.0357	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Lead-210	-1.37	U	1.97	1.97		2.32	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Lead-212	0.964		0.157	0.201		0.0636	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Lead-214	0.678		0.173	0.187		0.0623	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Potassium-40	11.1		2.03	2.33		0.398	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Protactinium-231	0.701	U	2.24	2.24		3.12	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Radium-226	0.657		0.188	0.200	0.700	0.0631	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Radium-228	0.658		0.366	0.372		0.153	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Thallium-208	0.276		0.105	0.109		0.0418	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Thorium-228	0.964		0.157	0.201		0.0636	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Thorium-232	0.658		0.366	0.372		0.153	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Thorium-234	1.69		0.933	0.949		1.27	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Uranium-235	0.127	U	0.357	0.357		0.438	pCi/g	08/16/18 10:10	08/16/18 11:09	1
Uranium-238	1.69		0.933	0.949		1.27	pCi/g	08/16/18 10:10	08/16/18 11:09	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S005**

**Lab Sample ID: 160-29330-5**

Date Collected: 06/29/18 13:07

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.742</b>		0.288	0.298		0.0926	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Actinium-227	0.0504	U	0.644	0.644		0.443	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Bismuth-212	0.0585	U	0.852	0.852		0.695	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Bismuth-214</b>	<b>0.592</b>		0.160	0.171		0.0478	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Cesium-137	-0.0406	U	0.0656	0.0658	0.0700	0.0692	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Cobalt-60	-0.0825	U	0.142	0.143	0.200	0.0685	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Lead-210</b>	<b>2.02</b>		1.22	1.24		0.714	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Lead-212</b>	<b>0.570</b>		0.109	0.132		0.0424	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Lead-214</b>	<b>0.670</b>		0.155	0.170		0.0582	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Potassium-40</b>	<b>11.1</b>		1.87	2.19		0.351	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Protactinium-231	-0.886	U	3.13	3.14		2.55	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Radium-226</b>	<b>0.592</b>		0.160	0.171	0.700	0.0478	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Radium-228</b>	<b>0.742</b>		0.288	0.298		0.0926	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Thallium-208</b>	<b>0.222</b>		0.0621	0.0662		0.0101	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Thorium-228</b>	<b>0.570</b>		0.109	0.132		0.0424	pCi/g	08/16/18 10:10	08/16/18 11:10	1
<b>Thorium-232</b>	<b>0.742</b>		0.288	0.298		0.0926	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Thorium-234	0.348	U	0.230	0.233		1.06	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Uranium-235	0.0436	U	0.0902	0.0903		0.364	pCi/g	08/16/18 10:10	08/16/18 11:10	1
Uranium-238	0.348	U	0.230	0.233		1.06	pCi/g	08/16/18 10:10	08/16/18 11:10	1

**Client Sample ID: PE2-RSYA2-U10-S006**

**Lab Sample ID: 160-29330-6**

Date Collected: 06/29/18 13:10

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.744</b>		0.219	0.232		0.0377	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Actinium-227	-0.305	U	1.09	1.09		0.888	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Bismuth-212	0.393	U	0.837	0.837		0.647	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Bismuth-214</b>	<b>0.783</b>		0.241	0.254		0.0920	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Cesium-137	0.00582	U	0.0794	0.0794	0.0700	0.0649	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Cobalt-60	0.0145	U	0.0721	0.0721	0.200	0.0345	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Lead-210	-0.963	U	2.29	2.29		1.92	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Lead-212</b>	<b>0.730</b>		0.135	0.155		0.0666	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Lead-214</b>	<b>0.798</b>		0.193	0.209		0.0751	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Potassium-40</b>	<b>11.4</b>		1.69	2.05		0.146	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Protactinium-231	0.984	U	2.52	2.53		2.77	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Radium-226</b>	<b>0.783</b>		0.241	0.254	0.700	0.0920	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Radium-228</b>	<b>0.744</b>		0.219	0.232		0.0377	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Thallium-208</b>	<b>0.307</b>		0.0953	0.100		0.0356	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Thorium-228</b>	<b>0.730</b>		0.135	0.155		0.0666	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Thorium-232</b>	<b>0.744</b>		0.219	0.232		0.0377	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Thorium-234	-0.0125	U	0.0425	0.0425		1.92	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Uranium-235	0.0589	U	0.326	0.326		0.571	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Uranium-238	-0.0125	U	0.0425	0.0425		1.92	pCi/g	08/16/18 10:10	08/16/18 12:01	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S007**

**Lab Sample ID: 160-29330-7**

Date Collected: 06/29/18 13:13

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.850</b>		0.248	0.263		0.0412	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Actinium-227	-0.0465	U	0.105	0.105		0.539	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Bismuth-212	0.359	U	1.05	1.05		0.830	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Bismuth-214</b>	<b>0.497</b>		0.136	0.146		0.0475	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Cesium-137	-0.00803	U	0.0825	0.0825	0.0700	0.0638	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Cobalt-60	-0.0350	U	0.131	0.131	0.200	0.0653	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Lead-210	0.440	U	1.18	1.18		0.863	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Lead-212</b>	<b>0.538</b>		0.119	0.138		0.0602	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Lead-214</b>	<b>0.459</b>		0.130	0.138		0.0748	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Potassium-40</b>	<b>13.8</b>		2.01	2.46		0.319	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Protactinium-231	0.000	U	0.513	0.513		2.45	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Radium-226</b>	<b>0.497</b>		0.136	0.146	0.700	0.0475	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Radium-228</b>	<b>0.850</b>		0.248	0.263		0.0412	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Thallium-208</b>	<b>0.194</b>		0.0724	0.0751		0.0284	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Thorium-228</b>	<b>0.538</b>		0.119	0.138		0.0602	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Thorium-232</b>	<b>0.850</b>		0.248	0.263		0.0412	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Thorium-234	0.196	U	1.35	1.35		1.10	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Uranium-235	0.163	U	0.359	0.359		0.294	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Uranium-238	0.196	U	1.35	1.35		1.10	pCi/g	08/16/18 10:10	08/16/18 11:59	1

**Client Sample ID: PE2-RSYA2-U10-S008**

**Lab Sample ID: 160-29330-8**

Date Collected: 06/29/18 13:16

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.981</b>		0.300	0.317		0.169	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Actinium-227	-0.635	U	1.36	1.36		1.09	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Bismuth-212	0.709	U	1.41	1.41		1.10	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Bismuth-214</b>	<b>0.746</b>		0.216	0.230		0.0784	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Cesium-137	-0.0151	U	0.127	0.127	0.0700	0.0548	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Cobalt-60	-0.0723	U	0.0810	0.0814	0.200	0.0887	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Lead-210	-0.632	U	2.47	2.47		2.06	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Lead-212</b>	<b>0.843</b>		0.163	0.196		0.0770	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Lead-214</b>	<b>0.784</b>		0.180	0.197		0.0924	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Potassium-40</b>	<b>11.3</b>		2.14	2.44		0.433	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Protactinium-231	1.16	U	3.77	3.77		3.06	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Radium-226</b>	<b>0.746</b>		0.216	0.230	0.700	0.0784	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Radium-228</b>	<b>0.981</b>		0.300	0.317		0.169	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Thallium-208</b>	<b>0.350</b>		0.0907	0.0977		0.0201	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Thorium-228</b>	<b>0.843</b>		0.163	0.196		0.0770	pCi/g	08/16/18 10:10	08/16/18 12:01	1
<b>Thorium-232</b>	<b>0.981</b>		0.300	0.317		0.169	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Thorium-234	0.985	U	1.53	1.53		1.02	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Uranium-235	-0.0301	U	1.04	1.04		0.640	pCi/g	08/16/18 10:10	08/16/18 12:01	1
Uranium-238	0.985	U	1.53	1.53		1.02	pCi/g	08/16/18 10:10	08/16/18 12:01	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S009**

**Lab Sample ID: 160-29330-9**

Date Collected: 06/29/18 13:19

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.921</b>		0.215	0.234		0.0668	pCi/g	08/16/18 10:10	08/16/18 12:02	1
Actinium-227	0.308	U	0.462	0.463		0.515	pCi/g	08/16/18 10:10	08/16/18 12:02	1
Bismuth-212	-0.550	U	1.04	1.04		0.817	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Bismuth-214</b>	<b>0.666</b>		0.166	0.180		0.0681	pCi/g	08/16/18 10:10	08/16/18 12:02	1
Cesium-137	-0.0262	U	0.0733	0.0733	0.0700	0.0581	pCi/g	08/16/18 10:10	08/16/18 12:02	1
Cobalt-60	-0.0214	U	0.114	0.114	0.200	0.0427	pCi/g	08/16/18 10:10	08/16/18 12:02	1
Lead-210	0.767	U	1.79	1.80		1.26	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Lead-212</b>	<b>0.669</b>		0.119	0.147		0.0535	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Lead-214</b>	<b>0.553</b>		0.128	0.140		0.0561	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Potassium-40</b>	<b>10.9</b>		1.62	1.97		0.350	pCi/g	08/16/18 10:10	08/16/18 12:02	1
Protactinium-231	0.349	U	1.55	1.55		2.40	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Radium-226</b>	<b>0.666</b>		0.166	0.180	0.700	0.0681	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Radium-228</b>	<b>0.921</b>		0.215	0.234		0.0668	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Thallium-208</b>	<b>0.235</b>		0.0682	0.0724		0.0250	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Thorium-228</b>	<b>0.669</b>		0.119	0.147		0.0535	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Thorium-232</b>	<b>0.921</b>		0.215	0.234		0.0668	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Thorium-234</b>	<b>0.936</b>		1.19	1.20		0.926	pCi/g	08/16/18 10:10	08/16/18 12:02	1
Uranium-235	0.0532	U	0.147	0.147		0.382	pCi/g	08/16/18 10:10	08/16/18 12:02	1
<b>Uranium-238</b>	<b>0.936</b>		1.19	1.20		0.926	pCi/g	08/16/18 10:10	08/16/18 12:02	1

**Client Sample ID: PE2-RSYA2-U10-S010**

**Lab Sample ID: 160-29330-10**

Date Collected: 06/29/18 13:22

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>1.22</b>		0.294	0.319		0.0511	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Actinium-227	-0.556	U	1.51	1.51		1.22	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Bismuth-212	-0.474	U	0.864	0.866		1.24	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Bismuth-214</b>	<b>0.544</b>		0.200	0.208		0.0940	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Cesium-137	-0.0353	U	0.104	0.104	0.0700	0.0824	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Cobalt-60	0.0436	U	0.103	0.103	0.200	0.0479	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Lead-210</b>	<b>2.95</b>		2.60	2.63		1.59	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Lead-212</b>	<b>0.903</b>		0.159	0.185		0.0641	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Lead-214</b>	<b>0.789</b>		0.158	0.177		0.0709	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Potassium-40</b>	<b>11.9</b>		2.14	2.45		0.565	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Protactinium-231	-0.646	U	4.43	4.43		3.62	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Radium-226</b>	<b>0.544</b>		0.200	0.208	0.700	0.0940	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Radium-228</b>	<b>1.22</b>		0.294	0.319		0.0511	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Thallium-208</b>	<b>0.309</b>		0.141	0.144		0.0645	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Thorium-228</b>	<b>0.903</b>		0.159	0.185		0.0641	pCi/g	08/16/18 10:10	08/16/18 23:10	1
<b>Thorium-232</b>	<b>1.22</b>		0.294	0.319		0.0511	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Thorium-234	0.187	U	0.544	0.545		2.01	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Uranium-235	-0.0214	U	0.0463	0.0464		0.838	pCi/g	08/16/18 10:10	08/16/18 23:10	1
Uranium-238	0.187	U	0.544	0.545		2.01	pCi/g	08/16/18 10:10	08/16/18 23:10	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S011**

**Lab Sample ID: 160-29330-11**

**Date Collected: 06/29/18 13:25**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.330</b>		0.137	0.141		0.210	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Actinium-227	-0.473	U	0.961	0.962		0.772	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Bismuth-212</b>	<b>1.75</b>		0.595	0.622		0.117	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Bismuth-214</b>	<b>0.598</b>		0.149	0.161		0.0459	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Cesium-137	0.0136	U	0.0675	0.0676	0.0700	0.0539	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Cobalt-60</b>	<b>0.0306</b>		0.0429	0.0430	0.200	0.0263	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Lead-210	0.148	U	1.73	1.73		1.42	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Lead-212</b>	<b>0.710</b>		0.115	0.148		0.0460	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Lead-214</b>	<b>0.609</b>		0.146	0.159		0.0530	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Potassium-40</b>	<b>12.6</b>		1.83	2.24		0.293	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Protactinium-231	0.872	U	2.17	2.18		2.39	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Radium-226</b>	<b>0.598</b>		0.149	0.161	0.700	0.0459	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Radium-228</b>	<b>0.330</b>		0.137	0.141		0.210	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Thallium-208</b>	<b>0.309</b>		0.0718	0.0786		0.0178	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Thorium-228</b>	<b>0.710</b>		0.115	0.148		0.0460	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Thorium-232</b>	<b>0.330</b>		0.137	0.141		0.210	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Thorium-234</b>	<b>1.95</b>		0.974	0.995		0.674	pCi/g	08/16/18 10:10	08/16/18 11:59	1
Uranium-235	0.0623	U	0.147	0.147		0.544	pCi/g	08/16/18 10:10	08/16/18 11:59	1
<b>Uranium-238</b>	<b>1.95</b>		0.974	0.995		0.674	pCi/g	08/16/18 10:10	08/16/18 11:59	1

**Client Sample ID: PE2-RSYA2-U10-S012**

**Lab Sample ID: 160-29330-12**

**Date Collected: 06/29/18 13:28**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.643</b>		0.124	0.140		0.0254	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Actinium-227	0.0274	U	0.431	0.431		0.570	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Bismuth-212	-0.0514	U	0.623	0.623		0.509	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Bismuth-214</b>	<b>0.413</b>		0.128	0.135		0.0515	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Cesium-137</b>	<b>0.102</b>		0.0344	0.0360	0.0700	0.00677	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Cobalt-60</b>	<b>0.0471</b>		0.0380	0.0383	0.200	0.0237	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Lead-210	-0.443	U	1.08	1.08		1.07	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Lead-212</b>	<b>0.521</b>		0.0889	0.112		0.0377	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Lead-214</b>	<b>0.431</b>		0.104	0.113		0.0435	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Potassium-40</b>	<b>8.82</b>		1.28	1.56		0.268	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Protactinium-231	-0.843	U	2.61	2.62		2.13	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Radium-226</b>	<b>0.413</b>		0.128	0.135	0.700	0.0515	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Radium-228</b>	<b>0.643</b>		0.124	0.140		0.0254	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Thallium-208</b>	<b>0.216</b>		0.0543	0.0587		0.0165	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Thorium-228</b>	<b>0.521</b>		0.0889	0.112		0.0377	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Thorium-232</b>	<b>0.643</b>		0.124	0.140		0.0254	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Thorium-234	0.000	U	0.739	0.739		1.14	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Uranium-235	-0.00205	U	0.366	0.366		0.438	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Uranium-238	0.000	U	0.739	0.739		1.14	pCi/g	08/16/18 10:10	08/21/18 10:54	1



# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S013**

**Lab Sample ID: 160-29330-13**

**Date Collected: 06/29/18 13:31**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>7.61</b>		0.580	0.969		0.131	pCi/g	08/16/18 10:10	08/16/18 13:48	1
Actinium-227	-0.697	U	1.51	1.51		1.03	pCi/g	08/16/18 10:10	08/16/18 13:48	1
Bismuth-212	1.03	U	2.77	2.77		2.24	pCi/g	08/16/18 10:10	08/16/18 13:48	1
Bismuth-214	0.189	U	0.312	0.313		0.285	pCi/g	08/16/18 10:10	08/16/18 13:48	1
Cesium-137	0.0321	U	0.151	0.151	0.0700	0.123	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Cobalt-60</b>	<b>0.0514</b>		0.0924	0.0926	0.200	0.0426	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Lead-210</b>	<b>2.28</b>		2.58	2.59		1.69	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Lead-212</b>	<b>7.89</b>		0.396	1.09		0.114	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Lead-214</b>	<b>0.727</b>		0.273	0.284		0.142	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Potassium-40</b>	<b>13.3</b>		2.12	2.52		0.378	pCi/g	08/16/18 10:10	08/16/18 13:48	1
Protactinium-231	0.000	U	1.53	1.53		4.81	pCi/g	08/16/18 10:10	08/16/18 13:48	1
Radium-226	0.189	U	0.312	0.313	0.700	0.285	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Radium-228</b>	<b>7.61</b>		0.580	0.969		0.131	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Thallium-208</b>	<b>2.72</b>		0.252	0.379		0.0613	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Thorium-228</b>	<b>7.89</b>		0.396	1.09		0.114	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Thorium-232</b>	<b>7.61</b>		0.580	0.969		0.131	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Thorium-234</b>	<b>1.78</b>		1.75	1.76		1.37	pCi/g	08/16/18 10:10	08/16/18 13:48	1
Uranium-235	-0.0517	U	0.430	0.430		0.807	pCi/g	08/16/18 10:10	08/16/18 13:48	1
<b>Uranium-238</b>	<b>1.78</b>		1.75	1.76		1.37	pCi/g	08/16/18 10:10	08/16/18 13:48	1

**Client Sample ID: PE2-RSYA2-U10-S014**

**Lab Sample ID: 160-29330-14**

**Date Collected: 06/29/18 13:35**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.883</b>		0.178	0.199		0.0369	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Actinium-227	0.256	U	0.740	0.740		0.501	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Bismuth-212	0.0751	U	0.974	0.974		0.795	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Bismuth-214</b>	<b>0.684</b>		0.171	0.185		0.0647	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Cesium-137	0.0268	U	0.0554	0.0554	0.0700	0.0293	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Cobalt-60	0.0146	U	0.0138	0.0139	0.200	0.0584	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Lead-210	0.964	U	1.52	1.53		0.995	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Lead-212</b>	<b>0.722</b>		0.131	0.161		0.0672	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Lead-214</b>	<b>0.722</b>		0.168	0.184		0.0699	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Potassium-40</b>	<b>12.5</b>		1.81	2.22		0.285	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Protactinium-231	-1.01	U	3.35	3.35		2.72	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Radium-226</b>	<b>0.684</b>		0.171	0.185	0.700	0.0647	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Radium-228</b>	<b>0.883</b>		0.178	0.199		0.0369	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Thallium-208</b>	<b>0.309</b>		0.0791	0.0854		0.0254	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Thorium-228</b>	<b>0.722</b>		0.131	0.161		0.0672	pCi/g	08/16/18 10:10	08/21/18 10:54	1
<b>Thorium-232</b>	<b>0.883</b>		0.178	0.199		0.0369	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Thorium-234	-0.163	U	1.37	1.37		1.13	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Uranium-235	0.208	U	0.390	0.390		0.325	pCi/g	08/16/18 10:10	08/21/18 10:54	1
Uranium-238	-0.163	U	1.37	1.37		1.13	pCi/g	08/16/18 10:10	08/21/18 10:54	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S015**

**Lab Sample ID: 160-29330-15**

Date Collected: 06/29/18 13:39

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>1.04</b>		0.352	0.367		0.123	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Actinium-227	0.487	U	1.07	1.07		0.861	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Bismuth-212	0.426	U	0.683	0.685		0.504	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Bismuth-214</b>	<b>0.855</b>		0.212	0.230		0.0757	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Cesium-137	0.00298	U	0.0743	0.0743	0.0700	0.0609	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Cobalt-60	-0.00437	U	0.0740	0.0740	0.200	0.0364	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Lead-210	-0.723	U	2.20	2.20		1.52	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Lead-212</b>	<b>0.878</b>		0.137	0.178		0.0496	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Lead-214</b>	<b>0.582</b>		0.166	0.177		0.0701	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Potassium-40</b>	<b>12.8</b>		1.91	2.32		0.411	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Protactinium-231	0.399	U	1.99	1.99		3.00	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Radium-226</b>	<b>0.855</b>		0.212	0.230	0.700	0.0757	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Radium-228</b>	<b>1.04</b>		0.352	0.367		0.123	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Thallium-208</b>	<b>0.272</b>		0.0835	0.0881		0.0327	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Thorium-228</b>	<b>0.878</b>		0.137	0.178		0.0496	pCi/g	08/16/18 10:10	08/16/18 13:45	1
<b>Thorium-232</b>	<b>1.04</b>		0.352	0.367		0.123	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Thorium-234	0.974	U	2.15	2.15		1.74	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Uranium-235	-0.0620	U	0.132	0.132		0.593	pCi/g	08/16/18 10:10	08/16/18 13:45	1
Uranium-238	0.974	U	2.15	2.15		1.74	pCi/g	08/16/18 10:10	08/16/18 13:45	1

**Client Sample ID: PE2-RSYA2-U10-S016**

**Lab Sample ID: 160-29330-16**

Date Collected: 06/29/18 13:43

Matrix: Solid

Date Received: 07/05/18 08:40

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>1.02</b>		0.299	0.317		0.119	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Actinium-227	-0.0139	U	1.16	1.16		0.951	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Bismuth-212	0.478	U	0.915	0.916		0.687	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Bismuth-214</b>	<b>0.825</b>		0.225	0.241		0.0770	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Cesium-137	-0.0120	U	0.128	0.128	0.0700	0.0882	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Cobalt-60</b>	<b>0.0572</b>		0.0515	0.0519	0.200	0.0214	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Lead-210	-0.130	U	2.53	2.53		2.09	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Lead-212</b>	<b>0.846</b>		0.163	0.197		0.0779	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Lead-214</b>	<b>0.781</b>		0.192	0.208		0.0734	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Potassium-40</b>	<b>12.7</b>		2.25	2.60		0.429	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Protactinium-231	0.540	U	2.25	2.25		3.56	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Radium-226</b>	<b>0.825</b>		0.225	0.241	0.700	0.0770	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Radium-228</b>	<b>1.02</b>		0.299	0.317		0.119	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Thallium-208</b>	<b>0.347</b>		0.101	0.107		0.0351	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Thorium-228</b>	<b>0.846</b>		0.163	0.197		0.0779	pCi/g	08/16/18 10:10	08/21/18 10:57	1
<b>Thorium-232</b>	<b>1.02</b>		0.299	0.317		0.119	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Thorium-234	-0.306	U	2.34	2.34		1.93	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Uranium-235	0.0614	U	0.267	0.267		0.675	pCi/g	08/16/18 10:10	08/21/18 10:57	1
Uranium-238	-0.306	U	2.34	2.34		1.93	pCi/g	08/16/18 10:10	08/21/18 10:57	1

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

**Client Sample ID: PE2-RSYA2-U10-S017**

**Lab Sample ID: 160-29330-17**

**Date Collected: 06/29/18 13:47**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>0.743</b>		0.210	0.224		0.132	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Actinium-227	0.00731	U	0.757	0.757		0.623	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Bismuth-212	0.499	U	0.911	0.913		0.717	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Bismuth-214</b>	<b>0.623</b>		0.144	0.158		0.0549	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Cesium-137	0.00151	U	0.0738	0.0738	0.0700	0.0607	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Cobalt-60	-0.0266	U	0.0884	0.0885	0.200	0.0426	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Lead-210	0.333	U	1.71	1.71		1.39	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Lead-212</b>	<b>0.767</b>		0.110	0.148		0.0472	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Lead-214</b>	<b>0.727</b>		0.156	0.173		0.0622	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Potassium-40</b>	<b>12.0</b>		1.50	1.94		0.278	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Protactinium-231	0.000	U	0.381	0.381		2.41	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Radium-226</b>	<b>0.623</b>		0.144	0.158	0.700	0.0549	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Radium-228</b>	<b>0.743</b>		0.210	0.224		0.132	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Thallium-208</b>	<b>0.235</b>		0.0660	0.0704		0.0267	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Thorium-228</b>	<b>0.767</b>		0.110	0.148		0.0472	pCi/g	08/16/18 10:10	08/16/18 14:41	1
<b>Thorium-232</b>	<b>0.743</b>		0.210	0.224		0.132	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Thorium-234	0.686	U	1.47	1.47		1.18	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Uranium-235	-0.00213	U	0.319	0.319		0.436	pCi/g	08/16/18 10:10	08/16/18 14:41	1
Uranium-238	0.686	U	1.47	1.47		1.18	pCi/g	08/16/18 10:10	08/16/18 14:41	1

**Client Sample ID: PE2-RSYA2-U10-S018**

**Lab Sample ID: 160-29330-18**

**Date Collected: 06/29/18 13:52**

**Matrix: Solid**

**Date Received: 07/05/18 08:40**

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
<b>Actinium 228</b>	<b>1.10</b>		0.277	0.298		0.200	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Actinium-227	-0.414	U	1.20	1.20		0.976	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Bismuth-212	0.256	U	1.18	1.18		0.951	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Bismuth-214</b>	<b>0.743</b>		0.186	0.201		0.0628	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Cesium-137	-0.0184	U	0.0767	0.0767	0.0700	0.0615	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Cobalt-60	0.0308	U	0.0568	0.0569	0.200	0.0335	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Lead-210</b>	<b>2.93</b>		2.05	2.08		1.25	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Lead-212</b>	<b>0.784</b>		0.135	0.158		0.0638	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Lead-214</b>	<b>0.800</b>		0.160	0.180		0.0801	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Potassium-40</b>	<b>14.4</b>		1.88	2.38		0.142	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Protactinium-231	0.534	U	3.53	3.53		2.89	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Radium-226</b>	<b>0.743</b>		0.186	0.201	0.700	0.0628	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Radium-228</b>	<b>1.10</b>		0.277	0.298		0.200	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Thallium-208</b>	<b>0.207</b>		0.113	0.115		0.0573	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Thorium-228</b>	<b>0.784</b>		0.135	0.158		0.0638	pCi/g	08/16/18 10:10	08/16/18 14:42	1
<b>Thorium-232</b>	<b>1.10</b>		0.277	0.298		0.200	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Thorium-234	0.636	U	0.436	0.442		1.87	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Uranium-235	0.000	U	0.257	0.257		0.547	pCi/g	08/16/18 10:10	08/16/18 14:42	1
Uranium-238	0.636	U	0.436	0.442		1.87	pCi/g	08/16/18 10:10	08/16/18 14:42	1

# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-382800/1-A

Matrix: Solid

Analysis Batch: 384178

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 382800

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.06077		0.0749	0.0751		0.0546	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Actinium-227	0.1932	U	0.321	0.321		0.259	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Bismuth-212	-0.04965	U	1.44	1.44		1.19	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Bismuth-214	0.01509	U	0.179	0.179		0.146	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Cesium-137	-0.02713	U	0.0710	0.0710	0.0700	0.0642	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Cobalt-60	-0.02182	U	0.102	0.102	0.200	0.0503	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Lead-210	1.016		1.06	1.07		0.690	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Lead-212	0.01635	U	0.113	0.113		0.0918	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Lead-214	-0.009506	U	0.0339	0.0340		0.101	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Potassium-40	0.1799	U	0.615	0.615		0.447	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Protactinium-231	0.5165	U	1.48	1.48		1.64	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Radium-226	0.01509	U	0.179	0.179	0.700	0.146	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Radium-228	0.06077		0.0749	0.0751		0.0546	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Thallium-208	0.02328	U	0.0664	0.0665		0.0258	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Thorium-228	0.01635	U	0.113	0.113		0.0918	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Thorium-232	0.06077		0.0749	0.0751		0.0546	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Thorium-234	0.2767	U	0.436	0.437		0.512	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Uranium-235	-0.01188	U	0.0178	0.0178		0.240	pCi/g	08/16/18 10:10	08/21/18 10:20	1
Uranium-238	0.2767	U	0.436	0.437		0.512	pCi/g	08/16/18 10:10	08/21/18 10:20	1

Lab Sample ID: LCS 160-382800/2-A

Matrix: Solid

Analysis Batch: 382780

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 382800

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.8	96.30		11.4		0.658	pCi/g	99	87 - 116
Cesium-137	28.2	30.97		3.25	0.0700	0.135	pCi/g	110	87 - 120
Cobalt-60	12.9	13.58		1.41	0.200	0.0879	pCi/g	106	87 - 115

Lab Sample ID: 160-29330-1 DU

Matrix: Solid

Analysis Batch: 382779

Client Sample ID: PE2-RSYA2-U10-S001

Prep Type: Total/NA

Prep Batch: 382800

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium 228	0.994		1.184		0.277		0.0376	pCi/g	0.33	1
Actinium-227	0.378	U	0.4990	U	1.12		0.900	pCi/g	0.06	1
Bismuth-212	0.473	U	0.4432	U	1.51		1.22	pCi/g	0.01	1
Bismuth-214	0.540		0.6195		0.164		0.0528	pCi/g	0.18	1
Cesium-137	0.0383	U	-0.02426	U	0.114	0.0700	0.0926	pCi/g	0.32	1
Cobalt-60	0.0328	U	0.01475	U	0.0732	0.200	0.0351	pCi/g	0.10	1
Lead-210	1.10	U	-1.278	U	1.88		2.15	pCi/g	0.60	1
Lead-212	0.693		1.026		0.202		0.0649	pCi/g	0.84	1
Lead-214	0.782		0.7737		0.183		0.0748	pCi/g	0.02	1
Potassium-40	11.6		12.56		2.26		0.396	pCi/g	0.21	1
Protactinium-231	0.000	U	-1.208	U	3.66		2.97	pCi/g	0.23	1

QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-29330-1 DU							Client Sample ID: PE2-RSYA2-U10-S001					
Matrix: Solid							Prep Type: Total/NA					
Analysis Batch: 382779							Prep Batch: 382800					
Analyte	Sample Result	Sample Qual	DU		Total	LOQ	DLC	Unit		RER	Limit	
			Result	Qual	Uncert. (2σ+/-)							
Radium-226	0.540		0.6195		0.164	0.700	0.0528	pCi/g		0.18	1	
Radium-228	0.994		1.184		0.277		0.0376	pCi/g		0.33	1	
Thallium-208	0.398		0.3341		0.0938		0.0297	pCi/g		0.30	1	
Thorium-228	0.693		1.026		0.202		0.0649	pCi/g		0.84	1	
Thorium-232	0.994		1.184		0.277		0.0376	pCi/g		0.33	1	
Thorium-234	2.53		-0.8936	U	2.05		1.65	pCi/g		0.84	1	
Uranium-235	0.125	U	-0.2607	U	0.472		0.594	pCi/g		0.45	1	
Uranium-238	2.53		-0.8936	U	2.05		1.65	pCi/g		0.84	1	

# QC Association Summary

Client: Aptim Federal Services LLC  
Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29330-4

## Rad

### Leach Batch: 382798

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29330-1	PE2-RSYA2-U10-S001	Total/NA	Solid	Dry and Grind	
160-29330-2	PE2-RSYA2-U10-S002	Total/NA	Solid	Dry and Grind	
160-29330-3	PE2-RSYA2-U10-S003	Total/NA	Solid	Dry and Grind	
160-29330-4	PE2-RSYA2-U10-S004	Total/NA	Solid	Dry and Grind	
160-29330-5	PE2-RSYA2-U10-S005	Total/NA	Solid	Dry and Grind	
160-29330-6	PE2-RSYA2-U10-S006	Total/NA	Solid	Dry and Grind	
160-29330-7	PE2-RSYA2-U10-S007	Total/NA	Solid	Dry and Grind	
160-29330-8	PE2-RSYA2-U10-S008	Total/NA	Solid	Dry and Grind	
160-29330-9	PE2-RSYA2-U10-S009	Total/NA	Solid	Dry and Grind	
160-29330-10	PE2-RSYA2-U10-S010	Total/NA	Solid	Dry and Grind	
160-29330-11	PE2-RSYA2-U10-S011	Total/NA	Solid	Dry and Grind	
160-29330-12	PE2-RSYA2-U10-S012	Total/NA	Solid	Dry and Grind	
160-29330-13	PE2-RSYA2-U10-S013	Total/NA	Solid	Dry and Grind	
160-29330-14	PE2-RSYA2-U10-S014	Total/NA	Solid	Dry and Grind	
160-29330-15	PE2-RSYA2-U10-S015	Total/NA	Solid	Dry and Grind	
160-29330-16	PE2-RSYA2-U10-S016	Total/NA	Solid	Dry and Grind	
160-29330-17	PE2-RSYA2-U10-S017	Total/NA	Solid	Dry and Grind	
160-29330-18	PE2-RSYA2-U10-S018	Total/NA	Solid	Dry and Grind	
160-29330-1 DU	PE2-RSYA2-U10-S001	Total/NA	Solid	Dry and Grind	

### Prep Batch: 382800

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29330-1	PE2-RSYA2-U10-S001	Total/NA	Solid	Fill_Geo-21	382798
160-29330-2	PE2-RSYA2-U10-S002	Total/NA	Solid	Fill_Geo-21	382798
160-29330-3	PE2-RSYA2-U10-S003	Total/NA	Solid	Fill_Geo-21	382798
160-29330-4	PE2-RSYA2-U10-S004	Total/NA	Solid	Fill_Geo-21	382798
160-29330-5	PE2-RSYA2-U10-S005	Total/NA	Solid	Fill_Geo-21	382798
160-29330-6	PE2-RSYA2-U10-S006	Total/NA	Solid	Fill_Geo-21	382798
160-29330-7	PE2-RSYA2-U10-S007	Total/NA	Solid	Fill_Geo-21	382798
160-29330-8	PE2-RSYA2-U10-S008	Total/NA	Solid	Fill_Geo-21	382798
160-29330-9	PE2-RSYA2-U10-S009	Total/NA	Solid	Fill_Geo-21	382798
160-29330-10	PE2-RSYA2-U10-S010	Total/NA	Solid	Fill_Geo-21	382798
160-29330-11	PE2-RSYA2-U10-S011	Total/NA	Solid	Fill_Geo-21	382798
160-29330-12	PE2-RSYA2-U10-S012	Total/NA	Solid	Fill_Geo-21	382798
160-29330-13	PE2-RSYA2-U10-S013	Total/NA	Solid	Fill_Geo-21	382798
160-29330-14	PE2-RSYA2-U10-S014	Total/NA	Solid	Fill_Geo-21	382798
160-29330-15	PE2-RSYA2-U10-S015	Total/NA	Solid	Fill_Geo-21	382798
160-29330-16	PE2-RSYA2-U10-S016	Total/NA	Solid	Fill_Geo-21	382798
160-29330-17	PE2-RSYA2-U10-S017	Total/NA	Solid	Fill_Geo-21	382798
160-29330-18	PE2-RSYA2-U10-S018	Total/NA	Solid	Fill_Geo-21	382798
MB 160-382800/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-382800/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29330-1 DU	PE2-RSYA2-U10-S001	Total/NA	Solid	Fill_Geo-21	382798